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PRACTICAL MEDICINE.

PRACTICAL MEDICINE,

WITH A SKETCH

OF

PHYSIOLOGY AND THERAPEUTICS.

BEING THE FOURTH EDITION

OF

MEADE'S MANUAL

FOR STUDENTS.

BY

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356, STRAND, LONDON.
1874.

LONDON:
SAVILL, EDWARDS AND CO., PRINTERS, CHANDOS STREET,
COVENT GARDEN.

TO

ROBERT DRUITT,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS,
AND
FELLOW OF THE ROYAL COLLEGE OF SURGEONS,

ONE

EMINENT ALIKE FOR QUALITIES

OF

HEAD AND HEART,

THIS LITTLE BOOK

Is Dedicated

BY

THE AUTHOR.

PREFACE.

WHEN asked by Mr. Renshaw to undertake a new Edition of Meade's "Manual for Students," it seemed to me that something might be made of the materials at my disposal, by adopting the old grouping of Physiology, Pathology (used in the wide sense), and Therapeutics. Proceeding on this plan, the work grew in its second division out of all proportion to the rest, so that this has become the chief feature of the book, whilst of the old matter all that remains are some passages in the part on Physiology. It is therefore as a book on the Practice of Medicine that this work must be judged, the other parts are mere sketches, though it is hoped useful ones. As the book is primarily intended for students, it has been my desire to make it as compact and clear as possible, and to eschew that which is still doubtful for what is not.

Of course such a work cannot in any way pretend to be exhaustive; it is enough if it is fairly accurate as far as it goes, and this I trust it will be found to be. Under the various diseases the conventional divisions into diagnosis, prognosis, &c., have been purposely avoided; for as each section is short, it has been my aim to make it a sketch of the disease as a whole, leaving the details to be filled in by subsequent study. The only distinct heading uniformly preserved is that of Treatment, and here the great object has been to tell the student what to do, as clearly and simply as possible, without confusing his mind by conflicts of opinion, which are but a poor substitute for the knowledge of what to do, and what to leave undone, in the management of Disease.

No one can be more sensible than I am of the many defects, and imperfections, in design, and execution displayed in different parts of the book; but in spite of these it is hoped that it may be of some use; for my great aim has been throughout to make it as practical as possible. In doing so I have been greatly aided by the kind and thoughtful suggestions of my friend and colleague Dr. Green, to whom I am in this respect deeply indebted, as I also am to my friends Drs. Bruce and Cantlie for compiling the Index at a time when hard pressed with other labours.

ALEXANDER SILVER.

2, STAFFORD STREET,
OLD BOND STREET, W.
March 1*st*, 1874.

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PART I.

PHYSIOLOGY.

By Physiology we mean that department of natural science, or rather Biology, which deals with the functions, and, as far as these are concerned, in the performance of functions—the structures of the animal body. Human physiology is restricted to the consideration of these as seen in the human organism.

Life implies change—*i.e.*, transmutation of force, and no better plan can be adopted for preserving a perfect view of the functions of the living body than by tracing the various substances which thus undergo change from their introduction into the body to their final escape as effete material; together with a consideration of the various modes of force thus developed.

FOOD.

Our food must in the main correspond to the substances found in the body which the elements of our diet are intended to repair. No simple substances, if we except oxygen, are, however, of any value. All must be in a state of combination, and these compound substances must be capable of direct absorption into the blood-vessels, or of being so after being acted on by the digestive fluids. Some of the substances thus consumed by us are incapable of oxidation; some are so; the former are mainly inorganic, the latter of organic origin, and derived partly from animals, partly from vegetables. The organic compounds mostly contain carbon, hydrogen, nitrogen, oxygen, sulphur, &c., in various states of combination; but all which are thus composed are not of use as alimentary substances. Thus urea, which is a substance capable of further change

outside the body, is useless as an article of food. Organic substances such as keratin and cellulose, which are neither soluble in water nor the digestive fluids, are useless as articles of food.

Besides *water* and *salts*, the most important articles of food belong to one or other of three groups—viz., the *albuminous*, the *fatty*, or the *starchy* or *saccharine*. Of albuminous substances we take meat as the type; of fatty, butter or oil; of starchy—although they contain other ingredients—bread and potatoes.

Of the various articles of food commonly employed, meat is the most important; it contains various albuminous substances, gelatine, ordinarily also fat, together with extractive matters, and salts. Milk contains albuminous matter—viz., casein, fat, in the shape of butter, and sugar, which belongs to the group of hydrocarbons, as well as water and many salts. Eggs contain similar substances, though not in the same relative quantities. The seeds of various plants called cereals yield important articles of food, such as wheat, maize, millet, barley, oats, rice, &c. They contain much starch, but also a certain proportion of albuminous matter. In peas this is called legumin. Potatoes, besides starch, contain a little albuminous matter. Various fruits and green vegetables also contain materials capable of supplying the wants of the body.

The most necessary salts are the chlorides, especially of sodium; and phosphates, especially of lime. Before being used it is customary to prepare most of the above articles for use by cooking; but some require no such preparation. The use of heat for this purpose is important in the case of starchy articles of diet, it tending to set the starch granules free, and by breaking up the tissues preparing them for the action of the digestive fluids.

To maintain an individual in perfect health a due admixture of the various substances above mentioned is necessary; though under certain circumstances a diet composed of one of these complex bodies, such as meat, may be substituted for all the others, no one simple substance will suffice to keep an animal alive. Starchy or saccharine matter may in a great part take the place of fats. Both are hydrocarbons.

DIGESTION OF FOOD IN THE MOUTH.

The food after due preparation, by cooking or other-

wise, is conveyed into the mouth in various fashions, being sometimes directly introduced by the hand, sometimes sucked in by creating a vacuum in the mouth. In this cavity it is reduced to a pulp by means of the teeth and mixed with the saliva. In these operations the tongue, teeth, and salivary glands are mainly employed. At the same time the tongue is the main seat of the simple sense of taste—*i.e.*, of the appreciation of salt, sour, sweet, and bitter; the more complex idea of flavour is derived from the upper part of the pharynx and posterior nares.

The *teeth*, in the adult subject, are thirty-two in number, sixteen in each jaw; they are divided into the *incisors*, *cuspidati*, *bicuspidati*, and *molars*. There are in each jaw *four* incisors, *two* cuspidate, *four* bicuspid, and *six* molar teeth. Each tooth is composed of a *crown* (or projecting part), a *neck*, and a *fang* or root. The crown is covered by a very hard substance denominated *enamel*, and each tooth contains a cavity which is filled with the dental *pulp*. This receives vessels and nerves through a canal in the root. The incisor and cuspidate teeth have single roots; the bicuspids are distinguished by their double roots; the two anterior molars of the upper jaw are furnished with *three* roots; the rest (with the exception of the *dentes sapientiæ*) have usually only two.

In the child, up to the age of seven or eight years, there are only twenty teeth—viz., four incisors, two cuspidate, and four molar teeth in each jaw.

The teeth under the microscope appear to be composed of an external coating, the *enamel*, which covers the crown of the tooth. That which covers the fang of the tooth is called the *cement* or *crusta petrosa*. The substance of the tooth itself is composed of *dentine*, made up of radiating and branching tubes.

The tongue is principally composed of muscular tissue. It is covered by a stratified epithelium of the squamous kind, and on its surface various kinds of projections called papillæ are to be observed.

Three kinds of papillæ are distinguishable on the surface of the tongue. First, the *calyciform papillæ* (papillæ vallatæ, or circumvallatæ), about a dozen in number, which extend in a double row across the tongue in a V-shape, the angle being formed by the *foramen cæcum* at the root of the tongue. These are large and flattened, and surrounded with an elevated ring of mucous membrane, whence their name. On the outer

surface of these, protected by the ring or vallum, are mainly situated the special taste corpuscles. Secondly, the *fungiform papillæ*, which are most abundant at the sides and tip, but more sparingly scattered on the dorsum. These are distinguished by their red colour, inasmuch as their investing epithelium is so thin that the blood is seen through it. Thirdly, there are the *conical or filiform papillæ*, by which the major part of the tongue is covered. These are whitish and covered with a dense epithelium; sometimes they end in a kind of fringe. Each of these three kinds of visible papillæ is thickly studded on its surface with minuter simple papillæ. The proper substance of the tongue is separated into two lateral portions by an imperfect raphé of a fibrous character.

The nerves of taste are the lingual and glosso-pharyngeal.

Into the cavity of the mouth a multitude of glands pour their secretions. Many of these are ordinary acinous mucous glands, situated in the walls of the mouth; but there are three principal pairs of glands called the *salivary* glands. Chief among these are the parotid glands. They are situated partly before and partly beneath the external ear, filling up the deep excavation which exists on the sides of the face, between the posterior edge of the ramus of the lower jaw, the meatus auditorius externus, and the mastoid process of the temporal bone. They extend vertically from the zygomatic arch to the angle of the lower jaw.

The duct of the gland (*ductus Stenonis*) arises in the *acini* of the gland, passes forwards on the masseter, and pierces the buccinator muscle and the mucous membrane of the mouth opposite the second molar tooth of the upper jaw.

The *submaxillary gland* is placed beneath and behind the lower jaw, resting on the mylo-hyoid muscle, and sends off a duct (*Wharton's duct*) which ascends obliquely upwards to the frænum linguæ, at the side of which it terminates.

The nerve supply of this gland is peculiar and important. It receives branches from the facial (chorda tympani), the lingual, and the submaxillary ganglion. Owing to the ease with which these can be isolated, it has been made the subject of special study as to how far each of these can influence glandular secretion.

The *sublingual glands* lie close under the tongue, on either side of the frænum, between the genio-hyoglossi and mylo-hyoidei muscles; it communicates with the cavity of the mouth by several minute orifices, and some-

times by one or two small ducts (*ducts of Bartholin*) which join the Whartonian duct.

By means of the teeth the food is torn and comminuted, being kept in its place between the jaws by means of the cheeks and lips on one side, and the tongue on the other. The motion of the jaws is in part rotatory, consisting of a backward and forward movement, as well as one from side to side. The presence of the food in the mouth stimulates the flow of saliva, which thus becomes thoroughly incorporated with the morsel chewed.

The saliva, which is an alkaline fluid, clear, transparent, and slightly mucilaginous, specific gravity 1005, contains, besides salts, such as chlorides and phosphates, sulphocyanide of potassium, and a peculiar substance called *ptyalin*. If taken from the mouth it always contains epithelium. Pure saliva may be obtained from Wharton's duct. Saliva, through its peculiar constituent ptyalin, has the property of speedily converting starch into grape sugar, at a temperature resembling that of the living body—viz., 100° Fahr. It has no special action on albuminous or fatty substances. By the saliva, therefore, the starchy portion of our food is, or may be, converted into sugar, and at the same time, by the aid of the buccal mucus, the mass contained in the mouth is softened, coated, and made ready for swallowing.

DEGLUTITION.

Besides the structures comprising the cavity of the mouth already spoken of, and by which together with the cheeks the morsel is forced into shape previous to swallowing, certain other structures are concerned in the complex act of swallowing. First among these come the soft palate, and the pillars of the fauces.

After being chewed the morsel is compressed against the hard palate by the tongue, beginning with its tip, and so successively other portions of its dorsum; thus forcing the morsel backwards. The soft palate is next folded backwards, and the anterior pillars of the fauces relax, whilst the soft palate helps to close the way into the posterior nares. Thus, the action of swallowing passes from a voluntary to an involuntary act, for the food is next seized in the pharynx by muscles not directly under the control of the will.

The *pharynx* is a musculo-membranous sac, continuous

on one side with the mouth and nostrils, on the other with the œsophagus and larynx. The roof of the pharynx is formed by the under surface of the basilar process; it lies on the bodies of the five superior cervical vertebræ, and its sides are composed of the three constrictors, the stylo-pharyngeal and palato-pharyngeal muscles. Into the pharynx open the *isthmus faucium* (from the mouth); the *posterior nares* (from the nostrils); the *Eustachian* tubes (from the tympani); the *glottis* (from the larynx); and finally, the communication with the œsophagus.

The morsel having passed the anterior pillars of the fauces, these contract, and return of the food is prevented. In this part the food is covered with the slimy secretion of the tonsils and neighbouring organs, the posterior pillars of the fauces make way for it at first, but in their turn contract, and by a simultaneous upward movement of the hyoid apparatus, the food passes over the opening of the larynx fairly down the pharynx.

The muscles of the pharynx are of the voluntary kind, but are governed reflexly, the afferent or centripetal nerve being the glosso-pharyngeal, the efferent or centrifugal, the vagus. In the œsophagus the muscular fibres gradually assume the non-striated character.

The *œsophagus* is a musculo-membranous canal which connects the pharynx with the stomach; it descends at first behind the trachea, then in the posterior mediastinum, behind the pericardium, and upon the aorta; and lastly, passes through the œsophageal opening of the diaphragm. The œsophagus consists of mucous and muscular coats; the muscular fibres are chiefly longitudinal; but circular fibres are found, especially about the cardiac extremity. The mucous membrane of the fauces and œsophagus is lined by a dense stratified epithelium of the squamous kind.

In the pharynx and œsophagus the food makes its way by a kind of vermicular action, the longitudinal muscular fibres of the latter being dragged up over it, so to speak, whilst the circular fibres force it on into the space thus prepared for it. Ordinarily, this part of the process is unaccompanied by sensation. Reaching the end of the œsophagus the food passes through a kind of sphincter and enters the stomach by its cardiac orifice.

The *stomach* is a musculo-membranous viscus, situate in the left hypochondriac and epigastric regions. It is distinguished into cardiac and pyloric extremities, greater

and lesser curvatures, greater and lesser ends. The *cardiac* extremity is continuous with the œsophagus; the pyloric with the duodenum. The *great* end (*cul-de-sac*) is the bulging portion which corresponds to the spleen; the *small* end is the portion in the neighbourhood of the pylorus. The *smaller curvature* is concave, and situated superiorly; the *greater curvature* is the convex inferior border, which corresponds to the spleen and transverse arch of the colon. The stomach is composed of three coats, the serous, muscular, and mucous. The serous tunic consists of the ordinary peritoneal coat, that is to say, a thin layer of nearly flattened cells lying on a fine connective tissue membrane; the *muscular* coat is composed of fibres, some of which are longitudinal and superficial; the next layer is circular and deeper-seated; there is also a deeper layer composed of oblique muscular fibres: the longitudinal are continued from the corresponding fibres of the œsophagus. The *mucous* coat of the stomach contains a great number of follicles, some peptic glands, giving rise to gastric juice, others merely mucous. The true gastric follicles are simple tubes, lined at the top with cylindrical epithelium, such as covers the walls of the stomach. At the blind ends of these, the epithelium assumes the character of large spherical secreting cells which give rise to the gastric juice. These glands are most abundant in the great cul-de-sac and middle part of the stomach. The mucous follicles are lined throughout with cylindrical epithelium; they are most abundant near the pylorus. Besides these there are in the walls of the stomach certain bodies not unlike the solitary glands found in the small intestine. Near the pyloric extremity is seen a circular prominence of the muscular and mucous coats, which is called the *valve of the pylorus*.

DIGESTION IN THE STOMACH.

The fluid secreted in the walls and follicles of the stomach is termed the gastric juice. This is a thin clear fluid of acid reaction mixed with the mucus secreted by the other glands. It contains free *hydrochloric* acid, sometimes also other acids, as lactic and acetic, and a substance having the power of dissolving solid albumen and called *pepsin*. For this solvent power the presence of an acid and a moderately high temperature, 100° F., are necessary. Through the action of these the albuminous

substances first swell up, then gradually pass into the condition of a fluid no longer coagulable by heat, acid, or alcohol. This is called *peptone*. This substance is much more diffusible than ordinary solutions of albumen. Gelatin is also in the stomach converted into a substance which no longer coagulates when cooled. The acidity of the gastric juice coagulates alkaline albuminate solutions, such as that of casein in milk, and speedily converts milk sugar into lactic acid. True gastric juice for experimental purposes has been procured by means of fistular openings into the stomach. An artificial variety may be prepared by adding acid to the scrapings of a pig's stomach, which is usually termed pepsin in shops. The quantity of gastric juice secreted is very large, but it is all or nearly all reabsorbed.

The action of gastric juice is limited to its effects on albuminous articles of diet. The starch which passes into the stomach unchanged by the saliva also passes out unchanged, the ptyalin being powerless in the presence of an acid. Fatty articles of food if contained in albuminous envelopes or in fatty tissue have these dissolved off, setting the fat free, but fat itself is not changed. The peculiar peristaltic motion of the stomach due to contraction of its muscular coats aids digestion by thoroughly mixing the gastric juice with the food, and constantly exposing a fresh surface to its effects. Most of the substances digested in the stomach are absorbed directly by the vessels in its walls.

The secretion of the gastric juice is much under the influence of the emotions, bad news often having the effect of completely arresting digestion or even getting rid of the food altogether by vomiting. Vomiting is usually a reflex act, and depends partly on contraction of the muscular walls of the stomach, but more in compression of the viscera by the abdominal walls squeezing the stomach against the fixed diaphragm.

The intestinal canal extends from the pylorus to the anus. It is distinguished into small and large intestines. The *small intestine* is subdivided into duodenum, jejunum, and ileum. The *duodenum* ascends from the pylorus to the under surface of the liver, then descends in front of the right kidney, and passes transversely across the vena cava and aorta to join the jejunum on a level with the second lumbar vertebra. At the angle of union formed by the descending and transverse portions of this

intestine, a small papilla is observed, at the summit of which are seen the united, or isolated, orifices of the ductus communis choledochus and the ductus pancreaticus.

The *jejunum*, so called from its being commonly found empty, occupies about two-fifths of the small intestine, and extends from the left side of the second lumbar vertebra to the *ileum*. This latter portion includes the remaining three-fifths of the small intestine, and terminates in the right iliac fossa by joining the cæcum. The duodenum is only partially covered by the peritoneum, except the first portion; the jejunum and ileum are contained in the folds of the mesentery, and form the intestinal convolutions which occupy the greater part of the inferior abdominal regions. The structure of the small intestine is analogous to that of the stomach, being formed of serous, muscular, and mucous tunics. The muscular fibres are longitudinal and circular. The former run immediately under the peritoneal coat in the direction of the long axis of the canal. The circular fibres take a transverse direction, and are connected to the mucous membrane by a layer of connective tissue.

The *mucous* coat of the alimentary canal presents certain differences, as we examine it in different parts of the tube. It is composed of three layers—viz., 1, an epithelium, 2, a basement membrane, or true mucous layer, elevated into innumerable papillæ called villi, which are so thickly set that they resemble the pile of velvet, and 3, a fibrous and muscular layer, uniting it to the more external coats of the viscus. It is arranged in *longitudinal* folds in the œsophagus; in the stomach it forms *rugæ*, or wrinkles, longitudinal and transverse, but chiefly the former; and in the greater part of the small intestine it is thrown into transverse folds, denominated *valvulæ conniventes*; these, however, do not exist in the lower part of the ileum.

The epithelium in the intestines is cylindrical, and the free ends of the cells are marked by striæ, giving them a ciliated appearance. The villi of the small intestines are minute projections of the basement membrane, containing a loop of capillary vessels, together with a little connective and muscular tissue with one or more absorbents. The villi are less numerous towards the lower end of the small intestine.

The *fibrous submucous* layer supports the mucous coat, and contains the mucous glands of the intestinal canal. These are of three kinds:—1, *Lieberkühn's follicles*, small blind tubes spread over the whole extent of

the *small intestine*; 2, Brunner's glands, resembling small portions of salivary gland or pancreas distributed singly in the mucous membrane, and most numerous in the upper part of the small intestine—*i.e.*, in the duodenum; 3, What are called Peyer's glands. These are of two kinds, solitary and aggregated. The former are covered by villi, the latter are not. Peyer's patches is the term given to the masses of aggregated glands. These are collected together into small oval patches, present a dotted appearance, and are chiefly found in the lower part of the ileum. Their long axis corresponds with that of the intestine, and they are never covered by valvulæ conniventes or villi. The follicles of which they consist correspond in structure to lymphatic glands, and are associated with the lymphatic system.

The *large intestine* is distinguished into cæcum, colon, and rectum. The *cæcum* is a pouch of the large intestine, situate in the right iliac fossa, which receives the termination of the ileum. It is covered on its anterior and lateral surfaces only by the peritoneum, and at its lower part is perceived a long worm-shaped tube, the *appendix vermiformis*, which is larger in the fœtus than in the adult.

The interior of the cæcum is partially divided by a fold of the mucous and muscular tissues, which is called the ileo-cæcal valve (*Bauhin's valve*), and prevents the return of excrementitious matter into the small intestine. The external surface is marked by three *longitudinal muscular bands*, which seem to commence on the appendix, and are continued along the colon, and spread out into a thick layer to embrace the rectum. These bands are shorter than the intestine, and hence give it a puckered appearance.

The *colon* extends from the right iliac region to the left, where it terminates in the rectum. It is distinguished into four portions—the ascending, transverse, descending, and sigmoid flexure. The *ascending* colon passes up from the cæcum, supported on the right kidney, through the right lumbar region, nearly as high as the liver, and then crosses, under the name of *transverse arch*, the epigastric region beneath the stomach. The upper convex edge of the arch corresponds with the liver and great curvature of the stomach; the lower surface rests on the mass of the small intestine, and appears to give attachment to the great omentum. The *descending* colon commences beneath the spleen, and passes down before the left kidney to join the *sigmoid flexure*, which will

be found lying loose in the left iliac fossa, curved somewhat into the form of the letter S, and terminating at the brim of the pelvis in the rectum. This latter intestine descends in front of the sacrum, rather to the left side, and terminates in the anus.

DIGESTION IN THE INTESTINES.

The food having undergone whatever change is possible in the stomach, and some of its soluble portions having been absorbed, sooner or later passes on into the small intestine. The acid fluid as it escapes from the stomach is denominated *chyme*, and besides the variously altered substances already referred to, contains others but little changed, especially fat; but the chyme as a rule contains also unaltered starch and unaltered albuminous substances. In the intestine the chyme encounters the intestinal juice secreted by the glands in the walls of the viscus, besides certain special secretions, notably the bile and pancreatic juice hereafter to be mentioned.

The intestinal juice is thin, yellowish, and strongly alkaline. It is capable of dissolving fibrin, and is doubtless greatly increased in quantity during intestinal digestion. However, this has much less influence on the food than the secretions of the liver and pancreas, which make their way by a common opening into the duodenum.

THE LIVER.

The liver is the largest gland in the body: it is situated in the right hypochondriac region and a part of the epigastric. The *upper surface* of the liver is convex, and rests against the diaphragm, to which it is attached by the suspensory ligament, which also divides it into right and left lobes. The *inferior surface* is concave, irregular, and marked by several eminences and fissures. The lobes of the liver are two—viz., the right and left: the lobules are the lobulus quadratus, lobulus caudatus, and lobulus Spigelii; these portions are separated by five fissures—the longitudinal; transverse; that for the ductus venosus; that for the vena cava and for the gall-bladder. All these parts are bound together by a dense sheath (*Glisson's capsule*). The *fissures* for the gall-bladder and cava are merely depressions to receive these parts.

The *ligaments* of the liver are, with the exception of the round ligament, formed by reflexions of the peritoneum.

The *round ligament* is a fibrous cord, occupying the anterior border of the longitudinal ligament. It is the obliterated umbilical vein of the fœtus.

The vessels contained in the liver may be distinguished into three sets—the hepatic artery, for nutrition; the vena portæ, for secretion; and the hepatic veins, for the purpose of carrying away residual blood. In addition to these, we have the branches of the hepatic duct, which commence by a number of radicles in the cellular substance of the liver. These minute ducts unite ultimately into two principal ones, which issue from the transverse fissure, and join to form the common hepatic duct; the latter, after a course of about an inch and a half, receives the ductus cysticus, and by their union is constituted the *ductus communis choledochus*.

The *gall-bladder* is situate in a depression in the inferior surface of the right lobe of the liver. Its mucous membrane contains many mucous secreting glands, as well as means for absorbing the more watery part of the bile.

The substance of the liver seems divided into minute portions called *lobules*, which are of an irregular form. The base of each lobule is flat, and rests upon a branch of the hepatic vein; each is enclosed in a connective tissue sheath, or capsule, derived from Glisson's capsule. Each lobule is thus separated from the rest by a distinct capsule, and the spaces between them are called *inter-lobular*. The centre of each lobule is penetrated by a small vein, which passes through it to join the hepatic vein at its base.

Each lobule contains a plexus of biliary ducts, a plexus formed by branches of the portal vein, a branch of the hepatic vein, and certain minute arteries.

The branches of the *portal vein* are partly distributed to the surface of the lobules, partly to their interior. The *inter-lobular* branches ramify on the exterior of the lobules, and communicate with each other in a very free manner throughout the liver. The *lobular* branches passing inwards, form a plexus within each lobule, and terminate in the middle by the central or *intra-lobular* vein, which in turn ends in the *hepatic* vein at the base of the lobule.

The *hepatic ducts* accompany the portal vein and hepatic artery throughout the liver to the substance of the lobules; then branches ramify with these between the lobules, and, having entered the lobules, form the *lobular biliary* plexuses. These bile ducts are lined throughout with a distinct epithelium, but they ultimately terminate in minute channels between the secreting cells and separated from them by no distinct wall of any kind.

The distribution of the *hepatic artery* resembles closely that of the portal vein and hepatic duct. The *inter-lobular* branches are principally distributed to the coats of the inter-lobular ducts; the lobular branches supply the lobules, and seem to terminate in the portal vein.

The *hepatic veins* commence in the interior of each lobule by the *intra-lobular* veins. These latter pierce the bases of the lobules to form the *sub-lobular* veins, and these uniting constitute the trunks which end in the inferior cava—the *hepatic veins*. Thus the distribution of the hepatic vein in no way corresponds with that of the hepatic artery, but that of the portal vein does, and its blood flows in the same direction.

The function of the liver is twofold. It forms *bile* and *glycogen*, and though the former only is concerned in digestion it is more convenient to discuss the double process at the same time. The *bile* is a neutral or weakly alkaline fluid of a colour varying from yellow through brown and green to black. When discharged from the liver it is more fluid and less tenacious than after it has been condensed and mixed with the mucus of the gall-bladder. It contains two important acids, commonly called the bile acids, combined with sodium. These are the glycocholic, or cholic, and the taurocholic acids. These acids are compound bodies made up of a nitrogenous body, glycin, and cholalic acid in the one case, and a nitrogenous body also containing sulphur, called taurin, and the same cholalic acid in the other. The bile owes its colour to certain bodies, of which the one seems a derivative of the other; these are, bilirubin, a reddish-yellow material, and the secondary substance, biliverdin, which is green, and most abundant in the bile of herbivorous animals. A fatty material called cholesterin is also constantly present. Its secretion is looked upon by some as very important. There are other less known products of the liver, among which urea is enumerated.

It has been a question, not yet fully settled, how far the

elements of bile are contained in the blood poured into the liver, and then separated by the liver cells, and how far these cells have a formative power. The flow of bile is favoured by a meat diet, and is greatest some hours after taking food; but the total quantity secreted varies greatly. The exact mechanism of the mode of its expulsion from the liver is little understood.

Two tests are generally accepted as indicative of the presence of bile—viz., Gmelin's and Pettenkofer's. Gmelin's test consists of the action of nitric acid on the colouring matters of bile whereby a play of colours, beginning with green if the colouring matter be mainly bilirubin, and passing on through various shades of blue and red to a kind of yellowish-brown. In Pettenkofer's test it is the acids which give the reaction. A little grape sugar is to be added to bile, and a drop of sulphuric acid added when a bright cherry-red is produced. This colour gradually grows into lake and purple, and may finally be destroyed by the addition of water.

In the tissues of the liver, as well as in certain other parts of the body, is to be found a substance in many ways similar to dextrin, and, like it, readily converted into sugar. In other respects, however, this substance, which is called glycogen, differs from dextrin. The glycogenic power of the liver, though varying with different kinds of food, is not dependent on any kind of food, and goes on when none but nitrogenous substances, as meat, are eaten. It has long been a question whether this substance is converted into sugar within the liver or no; the balance of authority is that it may be so converted—in other words, that the liver during life can and does produce sugar of the kind called glucose. Many substances within the system have the power of changing glycogen into sugar, especially liver substance, blood, saliva, and pancreatic juice. Glycogen is most freely formed with a diet rich in hydrocarbons; but even with such diet when in health the sugar formed from it is consumed within the system, and does not appear in the excretions. When any quantity of sugar appears in the urine, the condition constitutes the disease diabetes mellitus.

Glycogen gives with tincture of iodine a maroon red or violet. It does not reduce salts of copper as in Trommer's test, nor does it ferment with yeast.

During life only a small quantity of sugar can be detected in the liver, some say none at all, but after death the quantity rapidly increases. It would seem, there-

fore, that the glycogen is a true product of the liver cells, and that this is converted into glucose or grape sugar. It is carried away by the blood, probably to be consumed in keeping up animal heat.

THE PANCREAS.

INTESTINAL INDIGESTION.

The pancreas is, from its functions, one of the most important glands in the body. It is elongated in shape stretching behind the stomach from the spleen to the duodenum, and opening into the latter by an orifice common to it with the common bile duct. Through its middle part from end to end courses the main duct, into which open the smaller channels coming from the various groups of acini or lobules. In intimate structure the pancreas closely resembles the salivary glands, and in many respects its secretion closely resembles the saliva. This fluid is strongly alkaline, tenacious, and colourless. It coagulates with heat. It contains a substance called pancreatin, leucin, and various other products of the metamorphosis of albumen. The fluid itself has at least three well marked properties. 1, It converts starch into sugar. 2, It emulsifies fat; and 3, It dissolves coagulated albumen. Pancreatic juice acts on starch even more speedily than saliva does. Neutral fats it decomposes into their fatty acids and glycerin, the acid of the fat combining with the alkali of the secretion. The solution of coagulated albumen by pancreatin takes place in an alkaline solution, but the peptone so produced speedily passes into leucin and tyrosin. Gelatine is dissolved in like fashion.

In the intestines pepsin digestion is stopped chiefly by the action of the bile and the neutralization of the gastric acid. Owing, however, to the action of the pancreatic secretion, change goes on in the albuminous substances not yet dissolved and absorbed. The starch generally begins to change in the mouth, and what has remained unaltered in the stomach, is here completely transformed into sugar. But it is chiefly as regards fat elsewhere untouched that intestinal digestion is of importance. Both bile and pancreatic juice act upon it, and as a result of their joint action fats are decomposed, the acids combining with the alkali of the bile and pancreatic secretion. However, a portion of the undecomposed fat may be emulsified, and thus rendered capable of absorption.

In this way all substances capable of digestion are, if the supply of digestive fluids be sufficient, gradually altered, and as they are altered they are taken up (*see* ABSORPTION), so that finally only refuse material and undigested substances are left. The greater part of both the gastric and biliary secretions are reabsorbed, but the colouring matter and the cholesterin of the bile, in a more or less altered form, pass along, driven by the peristaltic motion of the gut, together with other refuse, and help to constitute the excrement or fæces. The colour of these is due to admixture of the bile; their smell to chemical alterations in them giving rise to volatile substances. During the passage of the fæces along the great intestine, they become condensed by the absorption of water, and finally accumulate in the rectum. The proper stimulus of this part of the gut is distension, and when this begins to be felt the gut contracts, the sphincter ani at the same time relaxing, and so the accumulated fæces are expelled. In most cases the force so obtained is reinforced by the pressure of the abdominal walls. For this purpose the diaphragm is fixed by pressure against the fully expanded lungs, the muscular walls of the abdomen contract on their contents, when, the pressure being by them repelled in every direction, acts of course in the one direction where the resistance is for the time being least, and so the fæces are expelled through the relaxed sphincter, partly by the direct force of the rectum, partly by the force of the walls of the abdomen indirectly brought to bear upon it.

ABSORPTION.

As already indicated, the digested portions of our food are gradually withdrawn from the stomach and intestines and directly or indirectly enter the circulation. They enter it directly if taken up by the veins, indirectly if by the absorbents. These last, during the period of digestion, contain in the parts where absorption is going on a milky-looking fluid, whence their name of *lacteals*. This milky-looking fluid is *chyle*, and the milky appearance is due to minute globules of fat or oil floating in a fluid which is nearly colourless.

The *lacteals*, or *chyliferous vessels*, convey the chyle from the intestines to the receptaculum chyli at the commencement of the thoracic duct. The lacteals of the small intestines arise in the villi, in blind extremities, but

their interior is in close connexion with the cylindrical epithelial cells lining the alimentary canal. The lacteals enter the mesentery, take the course of the vessels, and after anastomosing and crossing each other several times, gain the mesenteric and meso-colic glands; as they proceed they gradually unite, two or three converging to form one; thus they become diminished in number, until finally, towards the root of the mesenteric artery, two or three trunks are formed, which open into the *receptaculum chyli*. Sometimes, however, six or seven of these vessels open into the commencement of the thoracic duct. The lacteals of the small intestines, the cæcum, and the ascending and transverse colon, terminate as above described; those from the descending colon and its sigmoid flexure join some of the lumbar lymphatics. The lymphatics of the stomach, great omentum, spleen, pancreas, and liver, all ultimately join the thoracic duct directly or indirectly.

The *thoracic duct* (*ductus thoracicus sinister*) commences on the body of the third lumbar vertebra, by the union of five or six trunks, resulting from the lymphatic vessels already enumerated. Its course is upwards to the junction of the left internal jugular and subclavian veins, where it ends. This duct is sometimes straight, sometimes flexuous; as it passes along the thorax it receives *intercostal lymphatics*, and many branches from the liver, pleuræ, diaphragm, posterior mediastinum, &c.

As the chyle passes along the absorbents, it gradually loses its milky colour. The fatty particles which give rise to this by degrees disappear, and in their place are to be detected certain formed elements similar in all respects to white blood corpuscles, but which are here called lymph corpuscles or leucocytes. These are obtained from the lymphatic glands, through several of which the fluid has to pass between its abstraction from the intestine and the thoracic duct. Capillary attraction, diffusion, and various other forces play a part in the process of absorption, as seen in the bowel.

THE BLOOD AND ITS CIRCULATION.

The blood is a fluid of excessively complicated chemical composition in which float certain solid bodies called the blood corpuscles. It is red, opaque, and alkaline. The fluid portion as it exists in the blood-vessels is called the liquor sanguinis or blood plasma. The blood corpuscles are of two kinds, red, and white or colourless. To the former the

blood owes its red colour; to both kinds its opacity. The red corpuscles, which are as 350 or 500 to 1 of the other, are in mankind rounded bodies, flattened from side to side, or rather slightly biconcave, otherwise resembling a piece of money and possessed of no nucleus. In camels the shape is elliptical; in birds, elliptical and biconvex; in amphibians, elliptical and flattened; in fishes, between round and elliptical. The red corpuscles of oviparous animals—*i.e.*, birds, reptiles, and fishes—are nucleated. In most invertebrates there are no red corpuscles. The size of the human red corpuscles varies somewhat, but their diameter is from $\frac{1}{3500}$ to $\frac{1}{3200}$ of an inch, their thickness about a quarter of this. The corpuscles of the musk deer are very small, only $\frac{1}{12000}$ of an inch in diameter. The largest corpuscles are found amongst amphibians. Chief among these is the proteus, whose red corpuscles measure $\frac{1}{400}$ of an inch in length and $\frac{1}{777}$ in breadth. The structure of these bodies is peculiar. They have no nucleus, at least in the mammalia, and no membrane, so that they are in no sense of the word cells. They have been recently made out to consist of a porous or colourless basis called the *oekoid*, and a contractile coloured substance everywhere permeating and surrounding this, as does the animal portion of a sponge its horny support: this is called the *zooid*. The specific gravity of these corpuscles is rather greater than that of the liquor sanguinis (1052—1057), so that if allowed they slowly sink to the bottom on standing. This is commonly prevented by the coagulation of the blood. This sinking is favoured by their tendency to adhere together in masses resembling rouleaux of coin.

The colouring matter of living blood, which is called hæmoglobin, may be removed from the corpuscles in various ways; dilution by water is one of these. By this dilution too the corpuscles are made to swell up and become more or less spherical. The hæmoglobin is commonly combined with oxygen. Its exact relation to the zooid is not understood; it may, however, be procured in the form of rhombic prisms or plates from the corpuscles. It gives rise to peculiar absorption bands in the solar spectrum. The albuminous part of the corpuscles seems to be allied if not identical with the chemical substance globulin.

White or colourless blood corpuscles, commonly called leucocytes, are identical with lymph corpuscles. These

are small round spherical bodies, rather larger than the red corpuscles. They contain nuclei, and are outwardly somewhat granular in appearance, but they have no cell wall, and from time to time change their shape, throwing out, and retracting processes of their substance. An elevated temperature favours these movements. These corpuscles are commonly held to be the progenitors of the red. Other smaller formed bodies are to be seen floating in blood plasma, being probably white corpuscles in an early stage of growth.

The blood plasma is an alkaline fluid, containing (1) 90 per cent. of water. In it are dissolved various (2) albuminous bodies, (*a*) albumen precipitated by heat, (*b*) albumen precipitated by acids, and (*c*) that form which after abstraction of blood forms fibrin. These together amount to 8·10 per cent. of the plasma. There are also (3) certain products the result of metamorphic changes in albumen. Such are kreatin, sarkin, urea, and in smaller quantity uric and hippuric acids; (4) grape sugar is also found in varying amount according to the situation whence the blood has been derived. (5) Fat, fatty acids, soaps, cholesterin and lecithin in various chemical states are also found in it in small quantities. (6) A volatile odoriferous substance varying with each animal is another constituent. (7) Colouring matter is found in very small quantity, giving the plasma a yellowish tinge. (8) The most important salts are those of sodium, especially the chloride and carbonate. (9) The gases of the blood are of great importance. They are oxygen and carbonic acid in varying amount, nitrogen in more constant quantity. These are either dissolved in the blood, or held in loose chemical combination.

The gases of the blood may be abstracted in part by heating or by the air-pump. Oxygen is most abundant in arterial blood, carbonic acid in that contained in the veins. In arterial blood the oxygen amounts to 16·9 per cent. in volume, in venous blood only 5·96 volumes per cent. This exists partly in the red corpuscles, partly in the plasma. In the former it seems to be in loose chemical combination, in the latter it is partly at least merely dissolved. The oxygen is supposed on certain grounds to be in the active condition called ozone. Carbonic acid in arterial blood amounts to 30 vols. per cent., in venous blood 35 vols. per cent. It, too, is partly in solution, partly in chemical combination. It may combine chemically

with the sodium carbonate, and phosphate of the plasma, and it also seems to unite weakly with some constituent of the blood corpuscles. Nitrogen only exists to the extent of 1—2 vols. per cent.; it is in part in chemical combination with the corpuscles. According to the relative proportions of these gases, blood is to be considered venous or arterial. Arterial blood contains more oxygen and less carbonic acid than venous blood. The presence of the oxygen gives arterial blood its bright scarlet colour. This may be removed by agitation with carbonic acid, and again restored by agitation with atmospheric air or oxygen. Besides these differences, arterial blood is higher in temperature than, and differs somewhat in chemical composition from, venous blood. The shape of the corpuscles has an important bearing on the coloration of the fluid; the addition of salt, which causes them to shrink, renders the colour lighter, whilst water darkens them, at least in the first instance.

The total quantity of blood is estimated in adults at $\frac{1}{13}$, in new-born infants at $\frac{1}{17}$ of the whole body weight.

The removal of blood from the body is followed under ordinary circumstances by a peculiar phenomenon called coagulation. This depends on the formation and separation of a peculiar albuminous compound called fibrin, which, involving the corpuscles, gives rise to a solid mass of a red colour, called the *cruor* or *clot*. From this after a time a yellowish fluid escapes. It is called the serum. The clot thus consists of the corpuscles plus the separated fibrin—the serum of the blood of its plasma minus the constituents of fibrin.

When from any cause the corpuscles sink before the fibrin consolidates, the upper portion of the clot may present a whitish or buff appearance. This upper portion contracts more decidedly than the lower and coloured portion, so as to present a cupped appearance. In the olden time it was taken as a sure mark of inflammation that the blood withdrawn from the patient was buffed and cupped. The fibrin may be almost all removed from coagulating blood by beating it with a bundle of twigs, to which the fibrin adheres; the remaining coloured portion is called defibrinated blood. But though it seems of considerable bulk, the quantity of fibrin in the blood is but small—on an average, only two per cent.

The exact cause of coagulation is not quite plain. Fibrin, as such, does not exist in the blood, and other

fluids than blood may be made to coagulate. In the blood fibrin exists as fibrinogen, and this is made to consolidate by the presence of another substance, called fibrino-plastin. This last is akin to globulin, and has been termed paraglobulin. Its addition to such substances as acute pleuritic effusions will cause them to coagulate. Why blood does not coagulate under ordinary conditions within the body is not plain; the cause of its fluidity is commonly assumed to be the influence of the living walls of the blood-vessel. When every particle of blood is not in succession brought duly under this influence coagulation and arrest of circulation follow.

Coagulation is favoured by a slightly elevated temperature and the multiplication of points wherein to adhere, as well as the presence of air. It is retarded by the presence of alkalies or alkaline salts, or the precipitation of the fibrino-plastic body.

The blood, under ordinary circumstances, is in constant motion, passing to and from the central propelling power, the heart. Throughout its course it is contained within tubes or vessels, having for the most part distinct walls and called, from their contents, blood-vessels. These are of two kinds, one set carrying blood away from the heart, the other carrying it back again to that receptacle. The former are called the *arteries*, the latter the *veins;* whilst between the two are innumerable very fine channels through which the blood passes from one to the other, and in which it undergoes its most important changes. These are the *capillaries*. As the chief arteries of the body are those connected with the left side of the heart, which contain bright red blood—this is commonly called arterial blood—that called venous being dark red; but it must not be forgotten that the pulmonary artery contains dark or venous blood; the pulmonary vein that which is bright red or arterial.

As the blood issues from the heart only to return thither again its course throughout the body is called its circulation. But there are two circuits—viz., that through the body, and that through the lung, denominated respectively the *systemic* and *pulmonary* circulations. In either case, though other forces may exert some influence on the blood current, the main propulsive force resides in the heart, which is a hollow muscle of pyramidal form, placed obliquely between the lungs, and is composed of four cavities, denominated auricles and ventricles. The

two auricles occupy the base, one on either side; the two ventricles compose its body and apex.

The *right auricle* is placed at the right side of the base of the heart, and rests upon the diaphragm. It is of a very irregular shape, and is distinguished into the proper auricle and appendix. It is larger than the corresponding organ of the opposite side.

The *inner* wall of the auricle presents a thick septum (*septum auriculorum*), in the middle of which is a depression (*fossa ovalis*), which, in the fœtus, was occupied by the *foramen ovale*. This sometimes remains open for a considerable time after birth, and gives rise, though not constantly, to the disease called cyanosis. Inferiorly, the right auricle communicates by a wide circular opening with the right ventricle.

The *right ventricle* forms the greater portion of the anterior surface of the heart. The parts observable in it are the muscular bundles (*columnæ carneæ*), and their tendons (*chordæ tendineæ*); the tricuspid valves; the opening of the right auricle, and that of the pulmonary artery. The *columnæ carneæ* are rounded fleshy fasciculi, which arise from some point of the walls of the ventricle, direct themselves, becoming larger, from its summit towards its base, and terminate abruptly, each by several small tendons (*chordæ tendineæ*) which are inserted into the margins of the tricuspid valve.

The *tricuspid valve* consists of three membranous folds adhering by one edge to the circumference of the auriculo-ventricular opening, and with the other giving attachment to the chordæ tendineæ. The opening of the pulmonary artery is placed at the upper and left part of the right ventricle; it is furnished with three membranous folds (*semilunar* or *sigmoid valves*), the concavities of which look towards the artery, and at the centre of each fold at the free edge is placed a small tubercle (*corpus Arantii*), which aids still further in closing the artery. Between the semilunar valves and the wall of the artery are three pouches, called the *pulmonary* sinuses; there are three similar depressions in the aorta, at the valves which guard its opening.

The *left auricle* is situated at the left and posterior part of the base of the heart.

The *left ventricle* is narrower, but longer than the right, and its walls much thicker. Its internal structure is exactly the same, and it presents the same number of openings. The left auriculo-ventricular opening is guarded

by the *mitral valve*, so called because its free edge is divided into two mitre-like portions, to which the chordæ tendineæ are attached. The opening of the aorta, like that of the pulmonary artery, is guarded by three *semilunar* valvee, outside which we find dilatations, called the *aortic* sinuses. The free edges of these valves also contain corpora Arantii, and behind them we find the two orifices of the coronary arteries. The internal surfaces or cavities of the heart are lined throughout by a membrane, called the *endocardium*.

The cardiac nerves are chiefly derived from the vagus and the sympathetic.

The great vessels which arise from the heart are, the aorta and pulmonary artery; the great veins which empty themselves into it are, the two venæ cavæ and the pulmonary veins. These are so placed as to be continuous the one with the other, the blood issuing from the right ventricle to the pulmonary artery; thence through the pulmonary capillaries to the pulmonary veins and left auricle. From the left auricle the blood passes into the left ventricle, and thence to the system generally. It does not all, however, return directly by the venæ cavæ, for that portion which circulates in the intestines and spleen returns by the portal vein as far as the liver, and thence by the hepatic veins to the inferior cava.

In all mammals and in birds the heart is, as in man, composed of four separate chambers; but in reptiles, these communicate more or less decidedly. In fishes there is only a venous heart, consisting of an auricle and a ventricle; there is no left or arterial heart at all.

The motion of the heart whereby it expels its fluid contents is due to its self-contractile power. It is composed of peculiar muscular fibres striped, and anastomosing the one with the other. These are arranged in many layers, chiefly spiral in direction, and having an insertion about the junction of the auricles with the ventricles. Both sides of the heart act simultaneously, and the action of the ventricles follows speedily on that of the auricles. The contraction of each chamber is called its *systole*, its dilatation its *diastole*.

A single complete action of the heart may be described as follows:—The ventricles being fully distended, begin to contract. Two orifices are available for the exit of the blood—the auriculo-ventricular and arterial; but the former is promptly closed by its appropriate valve

acting as a floodgate, and preventing regurgitation, so that the blood is forced onwards into the arterial system. The vessels being always full, for each quantity of blood injected into the arteries a corresponding quantity must be ejected from the veins at the other end of the closed circuit into the heart itself—*i.e.*, into the auricles—which receive the blood during ventricular contraction. As soon as the ventricles cease to contract, the blood acted on by the elasticity of the distended artery tends to pass either onwards or backwards; but here too, floodgates in the shape of the semilunar valves, are set up, and all regurgitation is prevented, so that the force stored up in the elastic arteries is available to propel the blood onwards. But as the ventricles expand, the valves between them and the auricles open and allow of the accumulated contents of the auricles to flow into their own recesses, so that they are at once nearly refilled. Ventricular distension is completed by the contraction of the auricles and the complete ejection of their contents, which begins the cycle anew.

Simultaneously with the contraction of the ventricle, there is heard a sound, called the first or long sound of the heart. Its causation has been variously attributed, and is probably complex; but undoubtedly its main cause is closure and vibration of the auriculo-ventricular valves. Immediately thereafter is heard another sound—the second or short sound of the heart. This is easily traceable to the closure and vibration of the semilunar valves. On this follows a pause, during which the ventricle is expanding, and during the latter portion of which the auricle is noiselessly contracting. Normally, during this period no sound should be heard; occasionally, however, the period of auricular contraction is invaded by a morbid sound, commonly called presystolic.

Owing to the peculiar position of the heart and its muscular arrangement, the contraction of its ventricles causes their apex to impinge against the wall of the chest between the fifth and sixth ribs, about the line of the left mamma.

MOTION OF THE BLOOD IN THE VESSELS, AND THE CHANGES IT UNDERGOES.

Driven from the heart on its systemic course, the blood is received by the aorta. This vessel is mainly

composed of elastic tissue, and so readily *gives* to the force causing its distension; but, as soon as the distending force is withdrawn, it promptly recoils on its contents, and so the force stored up in it is devoted to the onward propulsion of the blood. In the smaller vessels there is however, besides the elastic, a muscular structure directly under the control of the sympathetic nerve system, and under its influence regulates the calibre of the vessels through which the blood flows. Between the heart, therefore, and this regulated obstruction in the small vessels, the blood will be in a state of considerable tension, and the more marked the contraction of these small vessels is, the higher is the blood tension. The flow into the arteries, as already seen, is intermittent; in the veins it is equable, so that it is between these that the change takes place, and in fact vessels which under ordinary circumstances present a continuous flow may, by dilatation, present an interrupted one.

When the blood is ejected from the ventricle, it impinges upon a column of blood comparatively at rest, and communicates to it a shock which is propagated along the vessels like a wave. This is owing to the increase of tension from the inrush of blood, and is gradually extinguished by the elasticity of the vessels. It constitutes the pulse wave, and enables us to ascertain the rate of the heart's action by counting the number of these waves or beats (usually about 72 per minute) in an artery. Though the heart is the great source of motion as far as the circulation is concerned, certain accessory powers are recognised. Thus the motions of the chest in respiration are upon the whole in favour of the circulation; the in-drawing power of inspiration being somewhat greater than the opposing power of expiration. The veins also being provided with valves or floodgates, any pressure on them by the action of surrounding muscles, must on the whole favour the blood-flow towards the heart. The exact influence of the muscular coat of the arteries is not quite certain; sometimes these vessels contract rhythmically, and this would favour the onflow of blood.

The circulating blood as it passes through the thin-walled capillaries, tends to give up some of its constituents and to take others from the surrounding textures. In certain organs these matters abstracted from the blood are partially altered for some special end. Such organs are termed *glands*, and these altered matters *secretions*.

In other cases the matters exuding from the vessels are waste products, which have to be got rid of, or the health of the body will suffer; such are called *excretions*. In all cases the tissues of an organ are thus nourished, for in the so-called non-vascular organs, as the cornea and cartilage, the interspaces between the blood-vessels are only larger than usual. Following the course of the circulation and passing by the liver, which has already been discussed (see page 11), the most important changes to which the materials absorbed from the alimentary canal are subjected, occur after the blood has been driven from the right side of the heart into the lung. These changes are all included under the title of Respiration; but it must be understood that these comprehend changes both in the blood and in the gases contained in the air-cells of the lung. The gases found in the lung are those of the common atmospheric air, though not perhaps in exactly the same proportions as they are encountered in that medium. The change mainly taking place in the lung consists in the absorption of oxygen by the blood, and the giving out of carbonic acid from the same; the change in the air in the lung being of course the reverse, viz., the giving-up of oxygen and increase by absorption of carbonic acid. In fishes, the change is effected, not by means of air, but by means of water, and the apparatus for effecting the interchange is termed a gill instead of a lung. The oxygen available for respiratory purposes in water is dissolved in it, and is not then held in chemical combination.

The lungs or organs whereby this interchange of gases between the air and the blood are two sacs so corrugated and folded as to present the largest possible extent of surface whereby the blood may be exposed to the influence of the contained air. These sacs communicate with the outer air by means of a tube called the trachea, at the upper portion of which is situate the larynx, or organ of voice, and the nasal passages.

In the chest the division of the trachea into bronchi takes place near the level of the third dorsal vertebra. The *bronchi* are two in number; they are composed of incomplete cartilaginous rings, and pass nearly at a right angle into the substance of the lungs. The *right* bronchus is shorter, wider, and placed more horizontally, than the left one, it passes under the azygos vein and the right branch of the pulmonary artery. The *left* bronchus is

embraced by the aorta and left branch of the pulmonary artery. Each bronchial tube as it enters the lung divides into two branches, one for each pulmonary lobe; and on the right side the inferior branch sends off a third tube for the middle lobe of the lung. After a short course the branches again subdivide; the subdivisions break up into smaller tubes, and this goes on in all directions, until each bronchus terminates in a small dilated cul-de-sac, each of which imperfect cavities is called an *air vesicle*, the aggregate of which constitutes the cellular structure of the lungs. The cartilaginous rings of the bronchi gradually lay aside their annular form, appear as distinct points, and finally disappear altogether near the termination of the tubes in these alveoli.

The bronchial arteries are given off from the aorta, and are concerned in the nutrition of the lung substance.

On the membrane lining the air-cells, the pulmonary artery ramifies; the blood in it when aërated being returned by the pulmonary veins. These vessels form an exceedingly fine network, in the meshwork of which cells resembling those of epithelium are to be seen. The bronchial arteries and veins nourish the substance of the lungs, as the hepatic artery does that of the liver. The *nerves* of the lungs are divided from the anterior and posterior pulmonary plexus of the pneumogastric. A great number of *lymphatics* pass from the pulmonary tissue to the bronchial glands, which surround the bronchi and trachea at the root of the lungs. These glands are often filled with carbonaceous or calcareous deposits in old age.

Whenever blood in thin-walled vessels comes near the surface of an air-containing cavity or the true surface of the body, a certain interchange takes place between the gases contained in the blood and the gases to which the blood-vessels are exposed in accordance with ordinary physical laws. This has sometimes been called external respiration in contradistinction to the interchange which goes on in the tissues themselves, save in the lung, the chief seat of interchange.

The air which is exhaled from the lung in the process of respiration is less rich in oxygen, but richer in carbonic acid than that which was inhaled. Moreover, it is warmer, and contains more watery vapour. The blood which leaves the lungs by the pulmonary veins is richer in oxygen, but contains less carbonic acid and water than that which

entered by the pulmonary artery; moreover, it is bright red or arterial, and not dark red or venous in colour. The exact relationship to heat or cold is not quite certain, for whereas part of the blood heat would be lost in heating the expired air and converting water into vapour, this would in part at least be compensated by the increased rapidity of oxidation in the blood contained in the vessels of the lung.

The absorbed oxygen mainly enters into chemical combination with the hæmoglobin of the blood, and is greater in amount than that contained in the carbonic acid expired. It is thus apparent that the excess is employed for other oxidative changes, as of hydrogen, sulphur, and phosphorus. The quantity of carbonic acid exhaled varies occasionally from various causes, but may be said to be rather over a pound and a half a day.

The movements of respiration are two in number—viz., those of drawing in pure air—*inspiration*, and that of expelling the foul air—*expiration*. The former is mainly a muscular act; the latter is chiefly due to the elasticity of the respiratory apparatus. The lungs are themselves highly elastic structures, and they are enclosed in air-tight cavities in such a way that the outer surfaces of the lungs are moulded on the inner walls of the chest and diaphragm. In this way the pressure of the atmosphere acting through the air-passages on the interior of the lung, balances the pressure of the same on the outer surface of the chest, and any alteration in the pressure on one implies the necessity for alteration in the pressure on the other. Thus if the area of the chest space is enlarged, either new air must rush in to fill the partial vacuum or the pressure on the outside of the chest would overbalance that from within; such a state of things is brought about if one tries to take in air with the mouth and nose shut; ordinarily these being left open as the chest expands, air rushes in to fill the gap, so that the process of inspiration resolves itself into that of expansion of the cavity of the chest. The walls of the chest are moveable, the ribs being jointed behind to the spine, and capable also of a certain motion in front. To these many muscles are attached capable of elevating them; and as they lie obliquely slanting downwards, elevation means expansion of the cavity which they enclose. Below the chest is bounded by an arched muscle the diaphragm, the dome-

shaped summit of which is turned towards the chest; depression of that dome which must follow from the contraction of the muscle, implies an increase of the size of the chest cavity. The ribs then being elevated by their attached muscles, and the diaphragm depressed, air must rush in to fill the fresh available space. This is inspiration. Presently the distended and elastic lungs and twisted ribs tend to return to their normal position, the abdominal walls push against the contents of the abdomen, and so tend to replace the depressed diaphragm, and in this way a portion of the contained air is driven from the chest. This is expiration. But this is ordinary respiration. In what is called forced respiration, many muscles not usually engaged in the process may be called into play, such are the sterno-mastoid, the trapezium, and even the pectoralis and latissimus dorsi; the powerful muscles of the abdomen may also be called into play to directly depress the chest wall. Although in forced respiration, that is to say, the deepest possible inspiration after the deepest possible expiration, more than 200 cubic inches of air can be changed at a breath, under ordinary circumstances, the quantity changed—the true breathing air—does not exceed 20 or 25 cubic inches.

The blood as it circulates undergoes certain changes due to its giving up nutrient elements to the tissues, and the absorption of more or less effete matters from these. But the blood itself changes especially as regards its solid constituents, the corpuscles; the old seem to undergo destruction and new ones to be formed from the colourless corpuscles. Originally the white corpuscles seem to be developed in the lymph glands. These glands are somewhat kidney-shaped, having an afferent and efferent vessel, and are enclosed within a covering of connective tissue. From this bands of the same kind of tissue are sent into the interior of the glands forming alveoli. In these alveoli are numerous collections of lymph corpuscles supported on trabeculæ of fine connective tissue, and permeated freely by channels without walls for the passage of the lymph or chyle. In many respects the spleen approximates to these structures. The small thickenings seen on branches of the splenic artery and termed Malpighian-bodies, are in all respects similar to lymph follicles, and the structure of the spleen itself does not differ very greatly from these, save in having its wall-less channels permeated by blood instead of lymph.

The bony marrow sometimes seems to serve as a source of colourless corpuscles. It is in the blood-vessels themselves that the white corpuscles become converted into red ones, though this too occurs in the spleen, for in the splenic vein intermediate forms are commonly to be met with. The mode and plan of the destruction of the red corpuscles is still more obscure; but the fact that the main colouring matters of the body have their origin in hæmoglobin points to such destruction going on probably both in the spleen and liver, but more especially in the latter.

Contained in porous vessels under high pressure, the fluid portion of the blood tends to pass outwards into the surrounding tissues, and to keep these more or less saturated. Each tissue seems to take from the common stock of blood what is necessary for its maintenance, whilst its refuse is washed away in the effused fluid, as that is re-absorbed by blood-vessel or lymphatic, and again reaches the circulating system. In the case of most tissues of the body we call this *nutrition;* but when the fluid is not absorbed directly, but is conducted in an altered condition out of the organ by a special duct or channel, such as is seen in most glandular organs, we term it secretion or excretion, as the case may be; the most important secretions, with the exception of those which have been already referred to under digestion, are milk and mucus. The chief excretions are, besides that of the lungs, those of the skin and kidneys.

The skin is an important excretory organ, having in its substance two kinds of glands extensively developed. One set called sebaceous are of the form called acinous, and mostly open into the cavities containing the roots of the hairs. Their secretion is fatty. The other glands consist of long tubes convoluted at their extremities, and opening obliquely on to the epidermal surface in most parts of the body. These are the sudoriparous or sweat glands, and give rise to a secretion which is for the most part watery. The production of this watery secretion and its conversion into vapour are powerful means of keeping down bodily heat when it tends to become excessive; and as ordinarily it is only produced in quantity with a somewhat elevated temperature, it constitutes one of the compensatory balances so often observed in the animal system. Though a considerable amount of fluid may be got rid of by the skin, the great bulk of it, together with almost all salts, escape by the kidneys, just as the great bulk of

the consumed carbon escapes by the lungs in respiration. The fæces are mainly composed of undigested and indigestible food; but they also contain some waste products, as water, colouring matter and cholesterin, which are excretory.

The urine whereby most of the products of the decomposition of nitrogenous substances within the body are eliminated is secreted by the kidneys.

The kidneys are situate one on each side of the vertebral column in the lumbar regions, corresponding to the two last dorsal and two first lumbar vertebræ. They are covered in front only by the peritoneum, but are completely invested by a fibrous capsule. When cut into they exhibit two distinct substances, cortical and medullary. The *cortical*, or *external*, substance is of a red colour, presenting several prolongations, between which are seen the conical bundles of the medullary substance. It is very friable. The *tubular*, *internal* substance is composed of a number of *cones*, the bases of which, enveloped by the cortical substance, correspond to the circumference of the kidney, while their apices are turned towards its pelvis. Each cone terminates in the pelvis of the kidney by a *papilla*, which is pierced by a number of small openings, the terminations of the tubuli.

The points of the papillæ are lined with mucous membrane, which forms a cup-like pouch (*calyx*) around the extremity of each. The number of the *calyces* is various; but they unite in the middle of the kidney into three cavities (*the infundibula*), which again unite to form one single cavity, the *pelvis*, occupying the posterior part of the fissure of the kidney, behind the renal artery and vein. The pelvis is continuous with the *ureter*, a cylindrical canal, which descends from the kidney along the posterior wall of the abdomen, crosses the common iliac artery and vas deferens, and penetrates obliquely the posterior and lateral part of the coats of the bladder.

The ultimate structure of the kidneys is as follows:—Traced backwards from the openings on the papillæ, the tubes of which the kidney is mainly composed seem to pass outwards for a considerable distance, and then seem to be formed by the junction of several smaller tubules. Following these, again, they are seen to tend backwards towards the pelvis, and again to turn outwards to the cortical substance, in which they end by dilated extremities. Intermixed with them are the capillaries,

arteries, and veins. One of the small arteries seems to pass into the blind extremity of each tubule, and there forms a fine vascular tuft of vessels in the form of a convoluted ball. These little arterial balls are visible to the naked eye, and are known under the name of the *Malpighian corpuscles*. From each of the arterial balls the blood is returned by a single vein, which afterwards subdivides and ramifies on the exterior of the tubes, and finally joins the renal veins. In this way there is a kind of double circulation in the kidney, somewhat analogous to that observed in the liver.

The kidneys receive their blood directly from the aorta by the renal arteries; their nerves are supplied by the renal plexuses, and the lesser splanchnic. The arteries of the renal capsules are rather numerous, and come from the aorta, phrenic, and renal arteries.

For the sake of convenience, most animals are provided with a hollow receptacle in which the urine, as it is secreted, may be stored for a time, and afterwards voluntarily extruded. This receptacle is the *bladder*, which is a hollow muscular viscus, occupying the anterior and upper part of the pelvis. It is partially surrounded by the peritoneum, which is reflected from it *posteriorly* and *on the sides*, forming the *false ligaments;* it is moreover supported by reflexions of the pelvic fascia (*anterior, and lateral true ligaments*), the remnants of the umbilical arteries, and the urachus.

The *muscular coat* of the bladder, like that of the intestinal canal, is composed of two layers; the *external* is longitudinal; the fibres of this layer pass up along the anterior wall of the organ, turn round its fundus, and descend along the posterior surface to the neck of the bladder; they also send off numerous lateral fibres. The *internal* fibres are very irregular in direction, being transverse or oblique, and frequently ranged in a spiral form. A few circular fibres surround the neck.

The *submucous* tissue of the bladder is pretty dense and extensile, and connects together in an intimate manner the mucous and muscular coats of the bladder.

The *mucous coat* is smooth, and is continued into all the openings which communicate with the viscus; in its empty state it presents numerous rugæ, but these disappear when it is full. At the base of the bladder is seen a smooth triangular space (*trigone*), the two posterior angles of which look towards the ureters, while the

anterior corresponds to the urethra. The external surface of the trigone is also of a triangular shape, and lies upon the rectum, being enclosed on each side by the vesiculæ seminales and vasa deferentia, and below by the middle lobe of the prostate. It is here that the recto-vesical operation for puncturing the bladder is to be performed. The arteries of the bladder are derived from the hypogastric, ischiatic, middle hæmorrhoidal, and internal pudic; its veins join the hypogastric veins; the nerves come from the hypogastric and sciatic plexuses. The *urethra* is the excretory canal of the bladder.

Urine is a clear transparent fluid of a more or less decided yellow tinge. It has a peculiar odour, and its specific gravity varies from 1010 to 1030 in health, though it may exceed either of these limits. In disease this is still more frequently the case. Its main constituents are *urea*, which is the final product of the oxidation of albuminous substances within the body; and uric acid, a less perfectly oxidized substance, combined with alkalies. Besides these there are a crowd of oxidation products more or less perfectly oxidized, as xanthin, sarkin, kreatin, glycin as hippuric acid, and ammonia. There are also present certain colouring matters in some form of blood product—uro-hæmatin, &c. and indican. Many salts besides those of the blood are found, especially sulphates and oxalates, apparently derived from the oxidation of taurin, together with a small quantity of sugar and certain gases. The colour and specific gravity of urine vary with its concentration, which entirely depends on the ingestion of food and drink and the activity of the skin. The acidity of the urine does not depend on the presence of a free acid, and after standing for a time it becomes alkaline, owing to the production of ammonia at the expense of the urea. In some of the lower animals hippuric acid is an important urinary constituent, whilst in reptiles and birds uric acid is the most considerable product.

The exact relation of the kidneys to the urinary constituents is not yet settled. Undoubtedly urea may be found in blood: but facts are not wanting which tend to show that the glandular structure of the kidneys has an important influence on its production. The quantity of urine secreted will vary directly with the blood-pressure in the vessels of the kidney; under ordinary circumstances it varies from 20 to 40 ounces.

The secretion goes on continuously, though more rapidly at one time than another, and passing along the ureters it gradually accumulates in the bladder. Its issue is effected partly by elasticity, partly also by muscular fibres; but its expulsion from the bladder in difficult cases is mainly effected by the abdominal muscles.

BODILY HEAT.

Besides the process already alluded to as nutrition, whereby each tissue and organ selected from the blood plasma with which it was more or less saturated, certain other results follow from the local change. Not only are fluids conveyed into the tissues in the way alluded to, but gases, especially oxygen, are also present, and as a consequence a variety of chemical changes, which may be summed up as oxidative changes, constantly go on. As a consequence of this oxygen disappears, and carbonic acid and the products of nitrogenous oxidation make their appearance. Outside the body, such chemical changes are accompanied by the manifestation of heat, and the interior of the body is no exception to the rule. Moreover, outside the body a certain portion of the force liberated may be made, by appropriate mechanism, to appear as work, and so too inside the body, wherever the appropriate mechanism is found. Besides the changes in the tissues themselves therefore, commonly called nutritive changes, we have the development of heat generally, and, where the appropriate mechanism is found, the capacity of doing work, or motion. No special apparatus is required for the production of heat, and it is most abundantly developed wherever for the time being chemical, *i.e.*, oxidative change, is most active. But the development of force as motion requires the presence of a special material called protoplasm, in an active state, but especially in that peculiarly developed modification of it seen in muscular tissue.

Heat is accordingly mostly developed in the internal organs, such as glands when in a state of activity, but to a considerable extent also in muscles, and that in two ways—(1) partly as the result of chemical change, and (2) partly from a portion of the work done by the muscle appearing only as heat owing to the friction of adjoining parts.

As already pointed out, the abstraction of heat by

expired air and its evolution from the surface of the skin by radiation, conduction, and the conversion of cutaneous transpiration into vapour, counterbalances the production going on within; so that the bodily temperature is kept as nearly as possible at a medium, however affected. This constant temperature is about 100° Fahr., but varies with the spot where it is taken, being higher in internal organs, lower in external ones. Increase of bodily heat may be effected by adding to the diet oily substances capable of yielding by oxidation much heat, and by preventing the evolution of heat from the body by wearing warm clothing. Our chief means of cooling the body consists, after the clothing has been reduced to a minimum, in some method whereby we favour the conversion of water into vapour at the expense of the bodily heat, or by favouring its abstraction by a frequently renewed current of air.

MECHANICAL ACTION.

As already indicated, the force liberated by the consumption of our food is primarily manifested as motion. The chief means of conversion are muscular fibres, of which there are two sorts—one striped transversely and generally directly under the control of the will; the other unstriped and generally uninfluenced, directly at least, by any exercise of the will. Hence these are sometimes spoken of as *voluntary* and *involuntary* muscular fibres. Voluntary muscles are commonly composed of elongated and rounded fibres of a reddish-brown colour. The ultimate fibrils composing these seem to consist of tubes of a substance called sarcolemma filled with protoplasm marked at regular intervals by transverse bands. To this protoplasm they owe, when stimulated, the power of self-contraction, approximating the extremities of the fibrils and so of any body, as bone, directly or indirectly attached to them; this they do indirectly by means of tendons. Various means of stimulation exist, but the most important are nerve influence and electricity. In muscles themselves, constant electric currents may be made out similar to those described in nerves.

The modes in which this mechanical force is applied are various, as are the purposes for which it is employed, but all consist of the application of the force to some one of the three varieties of lever known in mechanics. When

a muscle contracts, one or both extremities must move: generally one extremity is more firmly implanted than the opposite, and towards this as a fixed point the muscle usually contracts, enabling the individual to effect the various motions of the body according to the combination of muscles called into play. One of the most interesting of these applications of muscular force is in the production of voice. This takes place in a special apparatus called the *larynx*, or organ of the *voice*, which communicates above with the pharynx, inferiorly with the trachea. It is composed of five cartilages—the thyroid, cricoid, two arytenoid, and the epiglottis; it comprises also, ligaments, and numerous muscles, which open or close it, and regulate the tension of its various parts.

The *thyroid* cartilage, so called from its resemblance to an ancient shield, is composed of two broad plates, or *alæ*, which are united anteriorly, in the median line, at an angle so as to form a projection denominated the *pomum Adami*. The upper edge of each *ala* gives origin to a ligament which joins it to the os hyoides, and terminates in the *cornu;* the inferior edge is united by ligament to the cricoid cartilage, and also terminates in a species of cornu, which articulates with the side of the cricoid cartilage.

The *cricoid* cartilage forms a complete ring, and is situate between the above-mentioned cartilage and the upper part of trachea. It is narrow in front, and much deeper behind, where it is received between the alæ of the thyroid, and has the two arytenoids on its summit.

The *arytenoid* cartilages are placed, one on each side, on the superior edge of the cricoid cartilage; they are connected posteriorly by the arytenoid muscles, and give origin, anteriorly, to the *chordæ vocales*, which pass directly forwards, and are attached to the retiring angle of the thyroid cartilage. The summit of each arytenoid is surmounted by a small cartilaginous body, called the *corniculum*.

The *epiglottis* is composed of elastic cartilage, and rests with its base on a ligament which passes between the tongue, os hyoides, and thyroid cartilage: it is also connected to the base of the tongue by a fold of mucous membrane.

The *cuneiform* cartilages are two small cartilaginous

bodies which are found in the aryteno-epiglottidean ligaments.

The *ligaments* of the larynx, as described by anatomists, are very numerous; the principal are—1, the thyro-hyoid; 2, the crico-thyroid; 3, the thyro-arytenoid, or chordæ vocales; in addition to these there are the ligaments of the epiglottis, and those which attach the arytenoid cartilages and the inferior horns of the thyroid to the cricoid cartilage. The chief of these are the *chordæ vocales;* elastic cords stretching on either side from the base of each arytenoid cartilage, to the angle of the thyroid behind the pomum Adami. The aperture between them is called the *rima glottidis;* when this is open and relaxed it is triangular; when closed, somewhat, the cords are brought close to and parallel with each other. The anterior extremity of each cord is fixed; the posterior extremity, however, is attached to the arytenoid cartilage, which is moveable: and it is through the muscles attached to these cartilages that the cords are moved. Above each chorda vocalis is a semilunar fold of mucous membrane, and there is a deep cavity between the two, called sacculus laryngis.

The *glottis* is the name given to the upper aperture of the larynx. It is triangular; bounded before by the epiglottis, laterally by the *aryteno-epiglottidean ligaments*, which are two folds of mucous membrane, stretching between the points indicated by their names. When the larynx is raised by its muscles, and the tongue pushed back in the act of deglutition, this aperture is covered by the epiglottis, and so the food is prevented from entering the air-passages. But a yet surer defence against intrusion is provided by the muscles drawing the larynx upwards and forwards beneath the base or root of the tongue.

The principal muscles of the larynx are, the *crico-arytenoidei laterales* et *postici*, the *crico-thyroidei*, the *thyro-arytenoidei*, and the *arytenoideus*. The origins and attachments of the former muscles are pointed out by their names. Their uses are as follows:—the *arytenoideus* is formed of transverse and oblique fibres which connect the arytenoid cartilages. Its obvious use is, to draw the arytenoid cartilages together, and close the *rima glottidis;* that is, the aperture between the two chordæ vocales.

The *crico-thyroid muscles* are situated externally, and draw the thyroid cartilages forwards upon the cricoid, and so tighten the chordæ vocales.

The *crico-arytenoidei postici* open the rima glottidis.

The *thyro-arytenoidei* run under the mucous membrane along with the chordæ vocales. Their action is continued by the crico-arytenoidei laterales, and broadly may be said to contract the glottis, especially in speech.

The *trachea* is a cartilagino-membranous tube, which extends from the larynx to its division into bronchi, opposite the second or third dorsal vertebra. It is nearly of a cylindrical form, and is composed anteriorly of cartilaginous rings, united by fibrous elastic membrane, and posteriorly of muscle; its diameter in the adult subject is about eight or ten lines. It constitutes the respiratory tract between the lungs and the larynx, which again communicates with the open air by the mouth or nose through the pharynx.

These various muscles are under the control of two branches of the vagus, the superior and inferior or recurrent laryngeals. The former is a centripetal or sensory, the other merely a motor nerve, and is that which has control of the voice. In inspiration, moreover, there is a distinct widening, and in expiration a contraction of the glottis, only discernible by the laryngoscope.

The larynx may therefore be looked upon as a kind of wind instrument, whose sounding part consists of the vocal cords, the motive power being the air ejected from the chest. The air passing out under regulated pressure, and rushing through the narrow chink of the glottis, sets these in vibratory motion. The amount of the cords which may moreover be called into motion, and their tension, may be regulated by muscular power, and according to the length and slackness of the vibratory portion, so is the depth or gravity of the note. The higher the tension of the cords, the more rapid their vibration, the higher is the note educed.

Speech is something more than voice. It is articulate sounds so employed as to carry a definite significance of meaning from one individual to another. Certain arbitrary sounds are employed as bases, and these are subsequently contrived so as to produce the sound conventionally agreed upon to represent a certain meaning. These elements we call letters, and divide them into vowels and consonants. Their combination we call words. Some defects of speech depend on an inability to pronounce certain letters or combinations of them; and of course if there be loss of voice, or phonation, there will be the power of speech. Such is the case when no

air passes through the larynx after tracheotomy, or when there is paralysis of the vocal cords.

Language is something different from either voice or speech. We may have spoken languages where different sounds are employed to imply exactly the same idea, and we may have written languages to whose characters no sounds are known to correspond, and yet the language be intelligible. In loss of the power of language, *aphasia*, the patient may be able to pronounce certain words quite well, but no others, and so be compelled to use these to imply very various significations unknown to those around him.

THE NERVOUS SYSTEM.

The most highly specialized portion of the human frame, and in many respects by far the most important, is the nervous system.

This system may be distinguished into the *cerebro-spinal* or *voluntary*, and the *sympathetic* or *involuntary* systems. The former, again, may be divided into *cerebrum*, *cerebellum*, and *spinal cord* (including in this latter the *medulla oblongata*). With respect to its composition, the nervous matter is distinguished into two substances—the *cineritious* or *cortical*, and the *medullary*. These tissues consist of two kinds of elements—nerve cells and nerve fibres. The cells are of various sizes and shapes, some sending out many processes (multipolar), others few, but in all probability, all possess some. These processes pass from one cell to another, and finally seem to issue from these as nerve fibres. Of these there are two kinds, the medullated and non-medullated. The medullated are provided with a kind of sheath composed of a fatty matter, speedily solidifying after death, and giving the tissue that peculiar white shining appearance so characteristic of it. The non-medullated fibres want this, and are grey instead of white. These are chiefly found in the sympathetic system; the white or medullated fibres being found in the cerebro-spinal centres and nerves, the cells being confined to the centres alone.

The cineritious or cellular substance is situated externally on the cerebral hemispheres, but in the spinal marrow it is altogether deep-seated; on the contrary, the medullary or fibrous matter lies superficially on the spinal marrow, pons and crura of the brain, where it is readily distinguished (if the membranes be stripped off) by its shining white colour. The office of the grey matter is supposed to be that of originating motor acts, and r

ceiving impressions and converting them into motor acts, the conversion of impressions into sensation, the exercise of volition, and the other mental powers; the office of the white matter, to be that of communicating between different parts of the grey substance, and with the periphery of the body generally.

THE CEREBRUM constitutes the largest portion of the cerebro-spinal system. It is divided into two large lateral masses, called *hemispheres;* each of which is subdivided into three portions, denominated *lobes.* On the superior surface the student will remark the *great longitudinal fissure* into which the falx major dips; the *convolutions,* and the *sulci,* or spaces between the convolutions. On detaching the falx, and separating the hemispheres, the *corpus callosum* is exposed. The *corpus callosum* is a broad transverse commissure of medullary matter, by which the lateral hemispheres are united. Its upper surface is marked by a longitudinal line, called the *raphé,* and along it run the arteries of the corpus callosum. The inferior surface of the corpus callosum forms a roof for the lateral ventricles, while in the median line it lies immediately above the septum lucidum, fifth ventricle, and fornix. On dividing the corpus callosum, the *lateral ventricles* are exposed, one on each side; the parts contained in each of these ventricles (reckoning from before backwards) are—(1) the anterior horn; (2) the corpus striatum: (3) the thalamus nervi optici; (4) the posterior horn, or digital cavity; (5) the hippocampus minor; (6) the inferior horn; (7) the hippocampus major; in addition to these parts are also found in each lateral ventricle, (8) the tænia semicircularis; (9) the choroid plexus; (10) the corpus fimbriatum.

The inferior surface of the corpus callosum, as has been said, is continuous with the septum lucidum, which is formed of two thin layers of medullary matter, containing between them the fifth ventricle; beneath the septum lies the fornix; and if this latter body be divided in the centre, and reflected backwards and forwards, the whole of the lateral ventricles will be completely exposed.

The anterior horn of the lateral ventricle is a cavity in the anterior lobe of the cerebrum, which runs, curvingly, forward and outwards.

The *corpus striatum* is a pyriform body, broad before, contracted behind, placed obliquely, composed externally of grey substance, somewhat tinged with brown, but in-

ternally marked by an admixture of medullary lines (striæ), from which the name is derived. It is united to its fellow by the anterior commissure.

The *thalamus opticus* is a large mass lying behind the corpus striatum, and in apposition with the analogous body of the opposite hemisphere; the soft substance uniting the thalami is called the *commissura mollis*, and they contain between them the third ventricle. On the posterior border of each thalamus are observed two slightly raised eminences (*corpus geniculatum internum et externum*), which are connected by medullary striæ to the tubercula quadrigemina, and to the origin of the optic nerves.

The posterior horns of the lateral ventricles, instead of diverging, like the anterior ones, converge, and present when laid open the hippocampus minor, which is a small elevation of medullary matter.

The middle inferior horns pass backwards and outwards, but then wind forwards and inwards to terminate close to the fissure of Sylvius. In this horn we find the *hippocampus major*, a large elevation of nervous substance, marked by several indentations at its extremity (pes hippocampi). The inner border of the hippocampus major terminates in a narrow slip of white substance, called the *corpus fimbriatum*, which is continuous with the posterior pillar of the fornix.

The *tænia semicircularis* is a whitish strip of nervous substance, which runs between and separates the contiguous surfaces of the corpus striatum and optic thalamus.

The *fornix* is a flat, rather triangular-shaped band of medullary matter, which is placed between the septum lucidum and the third ventricle, from the latter of which parts it is separated by the tela choroidea. The inferior surface is marked by transverse lines, whence it is called *lyra*. The fornix terminates anteriorly in two pillars, which descend immediately *behind* the anterior commissure to the corpora mammillaria. The posterior part also divides into two pillars, which are amalgamated with the posterior extremity of the corpus callosum, and then branch off on either side to form the hippocampus major and minor.

The *tubercula quadrigemina* are four small eminences (the nates above, testes below), situate immediately behind the third ventricle.

The *commissures anterior* and *posterior*, are two cork-

like white bands, which run transversely in front of and behind the third ventricle. The anterior one runs in front of the pillars of the fornix, and penetrates the corpora striata. The posterior commissure is much shorter; it lies in front of the tubercula quadrigemina, and above the aqueduct of Sylvius, and unites the optic thalami.

On removing the pia mater which covers the middle and fore part of the cerebellum, the *valve of Vieussens* is exposed—a thin plate of nervous matter, which forms the roof of the fourth ventricle, extending from the tubercula quadrigemina to the cerebellum; if the valve be broken down, the floor of the fourth ventricle, and part of the aqueduct of Sylvius, will be seen, with the *calamus scriptorius* at its lower extremity.

The ventricles are lined by a distinct epithelial membrane—not by the arachnoid. The *third ventricle* of the brain is a narrow fissure, enclosed between the optic thalami, bounded above by the velum interpositum and fornix; below by the locus perforatus and tuber cinereum; in front by the anterior commissure and pillars of the fornix; and behind by the pineal gland, tubercula quadrigemina, and posterior commissure: at the anterior part is seen a small cavity (*foramen commune, foramen Monroi*), through which the lateral ventricles communicate with the third, and thus *indirectly* with each other: here also is another foramen, which leads to the *infundibulum*, a membranous prolongation, extending from the third ventricle to the pituitary body. From the posterior part, another foramen leads to a canal (*aqueduct of Sylvius, iter a tertio ad quartum ventriculum*), which forms a communication between the third and fourth ventricles. This canal passes backwards and downwards, beneath the tubercula quadrigemina, and above the pons Varolii.

The *fourth ventricle*, or ventricle of the cerebellum, is found at the extremity of the aqueduct, and concealed by the cerebellum. It contains a small choroid plexus, and is closed at the back part by a reflexion of the arachnoid. The *fifth* ventricle is the smallest, and is contained in the septum lucidum.

The cerebrum consists of white and grey matter variously disposed. A great mass of grey matter overlies the whole of the hemispheres, and this on section is found to consist of cells and fibres, transversely arranged and supported by a kind of connective tissue, sometimes called

the neuroglia. Besides this, there are more isolated masses of grey matter constituting the so-called basal ganglia. Of these the chief are the corpora striata, the optic thalami, the corpora quadrigemina, and the nasal lobes.

The grey matter of the hemispheres, which is in direct communication with that of the basal ganglia, and through them with the spinal cord, is specially concerned in all intellectual processes. The corpora striata are the great seats of motor power, and the optic thalami of common sensation. The corpora quadrigemina and nasal lobes are concerned in sight and smell respectively.

CEREBELLUM.—The structure of the cerebellum is much more simple than that of the cerebrum; its ratio to the latter is as one to eight in the adult. Its surface is marked by numerous concentric laminæ of grey matter, analogous to the cerebral convolutions. It is divided into two lobes by the falx cerebelli. On the inferior surface is seen the *inferior vermiform process*, a small lobule, situate in the median line. When the mass of the cerebellum is divided perpendicularly, an arrangement of the parts is seen, called *arbor vitæ*. This depends on the intermixture of white and grey matter. It also contains a *corpus dentatum*, or ganglion of grey matter enclosed in the white.

The cerebellum is connected to the cerebrum and spinal marrow by two distinct bundles of nervous matter—viz., first, the processus a cerebello ad testes; second, the corpora restiformia.

The first run up to join the corpora quadrigemina, and have the valve of Vieussens between them. The second, or corpora restiformia, pass downwards and form a union with the spinal cord. Besides these, a large bundle of commissural white fibres passes from each side of the cerebellum to the opposite (forming the *pons Varolii*) under the medulla oblongata.

BASE OF THE BRAIN.—At the base of the brain, the eye at once recognises several distinct masses—viz., the anterior lobes, the middle lobes, the pons Varolii, with the medulla oblongata, and the inferior surface of the cerebellum. The parts which occupy the median line (reckoning from before backwards) are, the median fissure, the commissure of the optic nerves, the infundibulum, and tuber cinereum, the corpora mammillaria, the locus perforatus, and the pons Varolii.

We also observe the olfactory nerves; the *fissure of Sylvius*, between the anterior and middle lobes, enclosing the island of Reil; the optic nerves, and their commissure. Behind this commissure, the infundibulum, tuber cinereum, and corpora mammillaria. On either side of the latter, the filaments of the third pair of nerves; the crura cerebri passing to the cerebrum from the pons; the pons Varolii itself, with the fourth pair at its sides, and the thick roots of the fifth pair emerging from its substance; the sixth pair of nerves at the point of junction between the pons and medulla oblongata; and, finally, the medulla oblongata itself, or upper portion of the spinal cord.

The *pons Varolii* (*cerebral protuberance, tuber annulare*) is a square mass of nervous matter, convex on the lower surface, which unites the lateral lobes of the cerebellum. Under cover of it ascend to the cerebral hemispheres the *crura cerebri*, the anterior and inferior portion of which comprises the motor tract directed to the corpora striata; the posterior and superior, the sensory going to the optic thalami, in the centre of which is a dark-looking portion of nervous matter, called *locus niger*. They are prolonged inferiorly into the *anterior pyramidal bodies*. The inferior surface of the pons is formed of firm transverse fibres, most of which compose the *crura cerebelli*.

On separating the vessels and membranes, we find that a lozenge-shaped space is enclosed between the diverging crura cerebri and the converging tractus optici. This space encloses the tuber cinereum, corpora mammillaria, locus perforatus, and origin of the third nerves. The corpora mammillaria (or *albicantia*) are little nodules of white matter, and are formed of the anterior pillars of the fornix, which descend to the base of the brain here. The locus perforatus is the floor of the third ventricle.

The *medulla oblongata* commences at the inferior edge of the pons, and is continuous with the spinal marrow. On the anterior surface, we see the median fissure separating the *anterior pyramids*, which are supposed to decussate nearly opposite the edge of the foramen magnum; these terminate superiorly in the crura cerebri, inferiorly in the anterior pillars of the spinal marrow; they are separated by a slight depression, where lie the *corpora olivaria*, two oblong elevations of grey matter, enclosed by a medullary layer. In the centre of each olivary body is found a *corpus dentatum*.

The *corpora restiformia* form the posterior columns of the medulla oblongata. They ascend into the lobes of the cerebellum, and are continuous inferiorly with the posterior columns of the spinal marrow.

In the medulla oblongata are situated certain very important centres, especially those of respiration and in part, at least, of circulation. Accordingly injury to this part may be followed by instantaneous death. To this spot the term vital knot has been applied.

The *medulla spinalis*, or spinal marrow, is that part of the cerebro-spinal system which is contained in the vertebral canal. It extends from the medulla oblongata to the level of the first or second lumbar vertebra. It presents two distinct swellings: one in the interval between the third and sixth cervical vertebræ, and a second corresponding with that between the tenth dorsal and first lumbar vertebra. The spinal cord is divided into two lateral halves by the anterior and posterior fissures. On each side we find two other fissures, less distinctly marked, along which the roots of the nerves are attached. The spinal marrow is suspended in the spinal canal by a peculiar membranous ligament (*ligamentum dentatum*), which resembles the teeth of a saw—the flat edge being attached to the pia mater, the pointed edge to the dura mater, midway between the foramina for the exit of the nerves.

The outer portion of the spinal cord is composed of white medullated fibres, of which it may be said roundly that the anterior pillars are motor, the posterior sensory. The grey matter is arranged so as to present four projections corresponding to the four origins of each pair of spinal nerves—viz., an anterior or motor, and a posterior or sensory on either side, these two freely communicating.

Cerebro-Spinal Nerves.—These nerves arise from the brain or spinal cord in pairs. They are symmetrical in their origin, and nearly so in distribution. They generally terminate by forming loops, plexuses, or small ganglia.

The cerebro-spinal nerves consist of medullated nerve fibres, united into bundles by a fine connective tissue, and the cerebral nerves are for the most part nerves of one kind of function, but the spinal nerves are both sensory and motor.

Cerebral Nerves. — These are commonly arranged into nine pairs, denominated according to their origins at

the base of the brain (reckoning from before backwards), first, second, third pairs, &c.

The *first pair* or *olfactory*, is not a real nerve, but a bulbous or ganglionic prolongation of the brain. It is triangular in shape, lies in a fissure between two cerebral convolutions, covered in by the arachnoid, and terminates in a bulb which lies on the cribriform plate of the ethmoid bone, and from which the real olfactory nerves are given off. It is said to *arise* by three roots; but more properly speaking, it is connected to the brain by three roots, two white and one grey. The two medullary roots are said to be connected with the corpus callosum and corpus striatum. The grey, or central one, arises from the posterior margin of the anterior lobe. The bulb sometimes contains a small ventricle. The *branches* descend through the cribriform plate, and are *distributed* to the mucous membrane covering the septum nasi and superior turbinated bones.

Second pair, or *optic.—Origin:* From the corpora quadrigemina and corpora geniculata. Each winds round the crus cerebri in the form of a flat band, called *tractus opticus;* it then assumes a rounded form, and unites with its fellow to form the *optic commissure*, in which both nerves are mingled, and interchange some filaments before their final distribution. From the commissure, the optic nerves pass obliquely outwards to the foramina optica in the sphenoid bone, through which they pass, and become remarkably diminished in size; they then penetrate the globe of the eye, internally and inferiorly to its centre, and terminate in the retina. Each nerve contains in its centre a very minute branch of the ophthalmic artery, called the *arteria centralis retinæ*.

Third pair, or *motores oculorum.*—These seem to originate from two small ganglionic masses situated on either side of the aqueduct of Sylvius, just behind the corpora quadrigemina. They run along the outer wall of the cavernous sinus, above the other orbitar nerves; then through the sphenoidal fissure, between the two origins of the external rectus muscles, and are distributed to five out of the seven muscles of the orbit—viz., to all the recti muscles (except the external), to the levator palpebræ, and inferior (but not the superior) oblique: the terminal filaments of this nerve enter the *ocular* surfaces of the muscles.

Fourth pair; pathetici, trochleares.—They originate

from the same nucleus as the motor oculi. They run round the crus cerebri, then along the margin of the tentorium, through the outer wall of the cavernous sinus, and into the orbit by the sphenoidal fissure, whence they pass to the *orbitar* surface of the superior oblique muscle.

The *fifth pair: trigemini, trifacial.*—The fifth is analogous to a spinal nerve, and has two portions, one *anterior* and smaller, which is *motor;* another *posterior* and larger, which is sensory. The *motor* portion arises low down in the medulla oblongata, the *sensory* from the floor of the fourth ventricle, not so low down, partly from the olivary bodies. The two portions run together over the edge of the petrous portion of the temporal bone, and there the posterior root forms the *Gasserian ganglion*, which gives off three branches; the anterior root continues its course *underneath* the ganglion, and joins its third branch before the latter has left the skull. From the anterior edge of the Gasserian, or semilunar ganglion, three branches are given off—viz., I. The ophthalmic. II. Superior maxillary. III. Inferior maxillary.

I. The *ophthalmic* nerve runs along the outer wall of the cavernous sinus, and before it enters the orbit subdivides into three branches—1. Frontal; 2. Lachrymal; 3. Nasal.

1. The *frontal* branch passes through the foramen lacerum orbitale, then runs between the periosteum and levator palpebræ superioris, and divides into the (*a*) supra-trochlear and (*b*) supra-orbitar nerves. (*a*) The *supra-trochlear* passes out of the orbit *above* the oblique tendon to the occipito-frontalis, corrugator supercilii, and scalp. (*b*) The *supra-orbitar* nerve (external frontal) emerges through the supra-orbitar foramen or notch to the same parts as the former branch. Both these nerves are often the seat of neuralgic affections. 2. The *lachrymal* nerve runs along the upper edge of the external rectus muscle to the lachrymal gland; it also gives filaments to the skin and conjunctiva lining the upper palpebra. 3. The *nasal* nerve enters the orbit between the two origins of the external rectus, then crosses over the optic nerve, and divides into two (*a* and *b*) filaments: (*a*) the *internal*, or *proper nasal*, enters the internal ethmoidal foramen, then runs along the cribriform plate, and dips into a peculiar foramen at the side of the crista galli, and is distributed to the interior of the nares; some twigs emerge beneath the nasal bones, and are distributed to the skin at the tip

of the nose. (*b*) The *infra-trochlear* branch of the nasal nerve runs along the superior oblique, but emerges *below* the trochlea, to be lost on the eyelids and parts about the lachrymal apparatus. Before its division, the nasal nerve gives off a branch to the *ophthalmic* ganglion, and two or three *ciliary* filaments.

This nerve exercises an important influence on the nutrition of the eyeball.

II. The *superior maxillary* nerve passes through the foramen rotundum, crosses the spheno-maxillary fissure; then traverses the infra-orbitar canal, and having made its exit by the foramen of the same name, is lost on the cheek.

The principal branches of the superior maxillary nerves are:—

1. An *orbitar* branch, subdividing into *malar* and *temporal*. 2. Filaments to Meckel's ganglion.

3. *Posterior superior dental* nerves: these wind round the tuberosity of the superior maxilla, enter peculiar foramina, and supply the molar teeth. 4. *Anterior superior dental* nerve descends along the anterior wall of the antrum in its proper canal to all the remaining upper teeth. 5. *Infra-orbitar nerve.* This is the terminal branch, which comes out through the infra-orbitar foramen, and is distributed in malar, palpebral, nasal, and labial branches; it anastomoses freely with the portio dura.

III. *Inferior maxillary nerve*, the largest of the three branches, passes through the foramen ovale into the zygomatic fossa, where it becomes united with the motor portion of the fifth nerve, and then divides into two branches, one (*a*) distributed to the muscles of mastication; the other (*b*), which is a sensitive nerve, to the tongue, teeth, and face.

(*a*) The *anterior*, or muscular, branch gives off, 1. *Temporal* branches, which pass out into the temporal fossa, and are distributed to the temporal muscle and behind the ear. 2. *Masseteric* branch, to the masseter muscle. 3. *Buccal* and *pterygoid* branches, to the buccinator and pterygoid muscles.

(*b*) The *posterior*, or sensitive branch, subdivides into three branches:—1. The *temporo-auricular* branch passes behind the neck of the lower jaw, is distributed to the parts about the ear, and finally accompanies the branches of the temporal artery. 2. The *inferior dental* nerve

descends between the pterygoid muscles, then enters the inferior dental foramen on the inner side of the ramus of the lower jawbone, gives filaments to *all* the lower teeth, and sends a branch out by the sub-mental foramen on the chin, which is lost in the muscles of the lower lip and in the integuments. Before entering the dental canal, it gives off the *mylo-hyoid* nerve, which is distributed to the muscle of that name, the digastricus, and the submaxillary gland. 3. The *lingual*, or *gustatory*, branch of the inferior maxillary nerve, having been joined by the chorda tympani, descends between the submaxillary gland and tongue, then accompanies the Whartonian duct, and mounts up over the sublingual gland to terminate in the mucous surface of the tongue. This branch supplies the different salivary glands, the tonsils, the mucous membrane and papillæ of the tongue, and supplies the front half of that organ with the sense of taste.

The sixth pair of nerves, abducentes, originate from a nucleus closely connected with that of the seventh or facial nerve. It runs forwards, towards the posterior clinoid process; then through the cavernous sinus, crossing the *outer* side of the carotid artery; then into the orbit, through the sphenoidal fissure and between the two heads of the external rectus muscle; and, passing along the *ocular* surface of this latter, is lost in its substance. In the cavernous sinus it receives a few filaments from the superior cervical ganglion.

The seventh pair of nerves comprise the *facial* and *auditory* nerves—*portio dura* and *portio mollis*. The *portio dura* or *facial* nerve, arises from the upper part of the medulla oblongata in the floor of the fourth ventricle. This is the special motor nerve of all the muscles of the face (the muscles of mastication excepted), the occipito-frontalis, the muscles of the ear, the stylo-hyoid muscle, the posterior belly of the digastricus, and the platysma myoides.

It runs in company with the portio mollis, from which it is very frequently separated by a small artery, into the internal auditory foramen, and at the bottom of this latter enters the aqueduct of Fallopius, which it then traverses, comes out through the stylo-mastoid foramen, and is distributed to the parts about the side of the face and head. In the aqueduct of Fallopius the facial nerve is joined by the petrous portion of the Vidian nerve: also by a communicating filament from the vagus.

It gives filaments to the stapedius and tensor tympani muscles. On coming out from the stylo-mastoid foramen it gives, 1. A *posterior auricular* branch. 2. A *digastric* branch to the muscle of the same name. 3. *Stylo-hyoid* branch to the stylo-hyoid muscle.

Having distributed these filaments, the body of the facial nerve enters the substance of the parotid gland, and soon breaks up into two (*a* and *b*) principal divisions of branches, which communicate freely together, and form a mesh of loops called the *pes anserinus*. (*a*) The *temporo-facial* division ascends through the gland, across the condyle of the lower jaw, and divides into—1. *Temporal* branches, distributed to the muscles and integuments of the frontal, temporal, and auricular regions. 2. *Malar* branches to the integuments of the cheek and levators of the upper lip. 3. *Buccal* branches, to the muscles of the lips.

(*b*) The *cervico-facial* division passes downwards towards the angle of the lower jaw, and is lost in the integuments of the lower part of the chin and the neck. The whole of the branches of the facial nerve form anastomotic loops freely with each other, and with those of the fifth pair.

The *portio mollis of the seventh pair, or auditory nerve*, arises from the floor of the fourth ventricle internally to the facial, which it accompanies to the bottom of the foramen auditorium internum. Here it divides into—1. The *nerve of the cochlea*, which penetrates in numerous filaments to the base of the cochlea, and is lost on the lamina spiralis and modiolus in the organ of Corti. 2. *Nerves of the vestibule* and *semicircular canals:* these are lost on the membrane lining the vestibule and semicircular canals.

The *Eighth pair of nerves* comprise the *glosso-pharyngeal, spinal accessory*, and *pneumogastric* nerves. The *glosso-pharyngeal* (*first division of the eighth*) arises, near the facial, from the medulla oblongata. It originates in a nuclear mass continuous with that of the vagus. It descends through the foramen lacerum posterius (*jugular foramen*), then crosses the jugular vein, and accompanies the stylo-pharyngeus muscle to the base of the tongue, in which it is ultimately lost. In its course this nerve gives—1. A branch of communication with the Vidian nerve. 2. Branches to the pharyngeal plexus. 3. Filaments to the hyo-glossus, tonsils, and epiglottis. 4. Filaments to the upper surface of the tongue.

This is a sensory mass, partly connected with the sense of taste in the back part of the tongue, partly also conducting impressions to the centre to be converted into motor acts, chiefly connected with deglutition.

The *pneumogastric* nerve, *nervus vagus* (*second division of the eighth*), arises from the same portion of the medulla as the preceding nerve, but a little below it. On passing through the foramen lacerum, the vagus presents a ganglionic enlargement; it then descends along the side of the neck, at first lying on the deeper-seated muscles, but soon enters the sheath of the carotid artery, in which it lies behind and between the carotid artery and internal jugular vein, and passes to the thorax; in the thorax it is found forming a plexus behind the root of the lungs, from which on either side the nerve again emerges, and, having passed down along the œsophagus, enters the abdomen by the œsophageal opening, to be lost on the stomach, liver, and neighbouring parts. There is a slight difference between the courses of the right and left vagi, as they descend to and enter the thorax. The *right* nerve is placed more anteriorly than the left, and crosses between the subclavian artery and vein at a right angle on the inner side of the scalenus muscle; the *left* nerve crosses obliquely the origin of the subclavian artery, and then passes along the descending aorta.

The principal branches of the pneumogastric nerve are—

1. *Communicating* branches to the neighbouring nerves and the superior cervical ganglion. 2. *Pharyngeal* nerve, arising just below the ganglionic enlargement. This branch descends behind the internal and external branches of the carotid artery, in an oblique direction, to the middle constrictor of the pharynx, near which it forms the *pharyngeal plexus*, with branches from the spinal accessory, glosso-pharyngeal, superior laryngeal nerves, and superior cervical ganglion; from this plexus, filaments are sent off to the mucous and muscular tissues of the pharynx. 3. *Superior laryngeal*. 4. *Cardiac* branches, which descend to the cardiac plexus. 5. *Inferior* or *laryngeal recurrent* nerve, given off just as the vagus is about to enter the thorax; that of the right side winds round the subclavian artery, from before backwards, and then ascends obliquely inwards, to the trachea, until it reaches the edge of the inferior constrictor, under which it passes to be distributed to the crico-arytenoid, thyro-

arytenoid, and arytenoid muscles; it also gives filaments to the mucous membrane. The *left* recurrent nerve is longer than the right, and winds round the arch of the aorta. 6. In the chest, the pneumogastric nerves descend through the posterior mediastinum to the root of the lungs, where they break up and form the *pulmonary* plexuses, from which a great number of filaments are sent off along the several ramifications of the bronchi. 7. *Œsophageal cords.* From the inferior portion of the plexus on either side are given off the œsophageal cords, one of which (*the left*) descends rather anteriorly — the other (*the right*) rather posteriorly—along the œsophagus, to the œsophageal opening in the diaphragm, through which they pass, and terminate in the stomach, and in the solar and hepatic plexuses.

It may be remarked that the right recurrent nerve does not *always* pass round the subclavian artery. This occurs in certain cases of anomaly affecting this vessel.

The vagus is a nerve of manifold function: it is the chief motor nerve concerned in swallowing; it governs the movements of the larynx, respiratory and vocal. It regulates the motions of the heart and lungs, and is undoubtedly concerned in digestion, if not also in other processes going on in abdominal organs.

The *spinal accessory nerve, third division of the eighth*, arises below the vagus, from a nucleus which lies behind the central spinal canal. The trunk of the nerve ascends through the foramen magnum, and thence passes to the jugular foramen, through which it makes its exit with the other divisions of the eighth nerve; the bulk of it enters the vagus; on separating from the latter, it descends a little, then penetrates the posterior surface of the sterno-cleido-mastoid muscle, and is finally lost in the trapezius. The external division gives various communicating branches, and supplies the trapezius and sterno-cleido-mastoid muscles. The internal has been supposed to pass specially to the larynx.

The *ninth pair*, or *hypoglossal nerves*, arise from a nucleus immediately in front of the last; it passes out through the anterior condyloid foramen, and, having crossed externally the branches of the carotid artery, turns upwards between the mylo-hyoideus and hyoglossus muscles, to be distributed to the muscular structure of the tongue.

The chief branches are — 1. *Descendens noni.* This

branch descends along the sheath of the carotid artery to the omo-hyoid, sterno-hyoid, and sterno-thyroid muscles, forming a loop with a branch of the third cervical nerve. It is sometimes concealed *in* the carotid sheath, when it will be found running down immediately upon the carotid artery. 2. Branches to all the muscles at the base and body of the tongue.

SPINAL NERVES.

The spinal nerves consist of thirty pairs—viz., eight cervical, twelve dorsal, five lumbar, and five sacral. Each spinal nerve arises by two *roots* separated by the ligamentum dentatum from the lateral surface of the spinal marrow, the anterior or motor *root* from the anterior or motor column, the posterior or sensitive from the posterior column of the cord—the latter soon forms a ganglion. The two roots pass out through the intervertebral foramina, and here unite to form a single spinal nerve of compound function. The nerve almost immediately divides into an anterior and posterior *branch*—the anterior and larger proceeds forwards to form the principal plexuses, the posterior passes backwards and is lost in the muscles of the back.

The *first* cervical (*sub-occipital*) nerve passes between the occipital bone and atlas, crosses the vertebral artery, and is distributed to the muscles at the back of the neck and occiput. The other superior cervical nerves give branches to the muscles which lie in the neighbourhood, communicate with the sympathetic nerve, and form, through means of their *anterior* branches, the cervical plexus. The *phrenic* arises from the third, fourth, and fifth cervical nerves; it descends along the scalenus anticus muscle, then enters the thorax, passes along the side of the pericardium, and is distributed to the diaphragm. The phrenic nerves also send filaments to the solar plexus, and to the liver; and it is supposed that the pain in the right shoulder felt in liver diseases, arises from the irritation of the terminal twigs of the phrenic, propagated upwards to the spinal cord, and thence reflected along some of the nerves which arise in the vicinity, and which supply the shoulder. This is the *inferior internal respiratory* nerve of Sir Charles Bell.

The *four inferior cervical nerves* together with the first dorsal, form the *axillary* or *brachial* plexus, which gives off the thoracic, scapular, and brachial nerves. These

latter comprise the circumflex, internal cutaneous, external cutaneous, median, ulnar, and musculo-spiral. From this part too arises the motor roots of the sympathetic.

The *dorsal* nerves are twelve pairs; like the other spinal nerves, they divide, on leaving the intervertebral foramina, into two branches: the posterior form the dorsal, properly so called; the anterior constitute the intercostal nerves.

The *lumbar nerves* are five pairs; being joined by a branch from the last dorsal, they form the lumbar plexus, which furnishes the musculo-cutaneous, inguino-cutaneous, genito-crural, anterior crural, obturator, and lumbo-sacral nerves.

The *sacral nerves*, in conjunction with the lumbo-sacral, form the sacral plexus, from which branches are distributed to the viscera of the pelvis, the organs of generation, and the lower extremities; viz., the hæmorrhoidal, vesical, uterine and vaginal branches; the lesser and greater sciatic, inferior gluteal, posterior cutaneous, and pudic.

The *sympathetic nerve* and centres consist of a nervous and ganglionated cord, which lies in front of the vertebral column, and extends from the head to the pelvis; it forms a distinct portion of the nervous system; although connected by twigs or roots with all the spinal nerves and some of the cerebral. It furnishes twigs to all the arteries, and to the viscera of the trunk. The sympathetic consists of pale non-medullated nerve fibres, grey in colour and gelatinous in consistence, differing in this respect from the ordinary white medullated nerve fibres. The fibres of the sympathetic are mainly motor or secretory and non-sentient. They are not under the control of the will, and are chiefly directed to non-striated muscular fibres. These fibres take their origin in the spinal cord, especially in the neck, so that extirpation of the superior cervical ganglion, or division of the cord in that situation, causes paralysis of the sympathetic above not below the point of section. The ganglia of the sympathetic nerve are situated in the *cephalic, cervical, intercostal, lumbar*, and *sacral* regions, and are named accordingly, cephalic, cervical, thoracic, abdominal, and pelvic.

(*a*) The chief *cephalic ganglia* are—

1. The *ophthalmic*, or *lenticular ganglion*, is found in the orbit between the external rectus and the optic nerve;

it furnishes the *ciliary* nerves, and communicates by distinct filaments with the nasal branch of the fifth and the third nerves. These have been denominated its *roots*. This ganglion also receives filaments from the sympathetic system.

2. The *otic ganglion* (ganglion Arnoldi) is a small, reddish-grey, soft ganglion, situated a little below the foramen ovale, on the inner side of the third branch of the fifth nerve, between this and the Eustachian tube. Two nerves come off from this ganglion, one of which is distributed to the tensor tympani muscle, the other—the nervus petrosus superficialis minor—enters a special canal in the temporal bone in front and to the outer side of the aqueduct of Fallopius, passes through this canal into the cavity of the tympanum, and joins the tympanic plexus of Jacobson. The otic ganglion communicates with the third division of the fifth nerve.

3. The *spheno-palatine* (*Meckel's*) ganglion is found in the pterygo-maxillary fossa, and furnishes (*a*) filaments to the superior maxillary nerve; (*b*) palatine nerves; (*c*) naso-palatine nerve, which runs obliquely along the septum nasi towards the foramen incisivum, and enters a small opening just behind this foramen to join the branch of the opposite side, and be lost on the palate. It next gives off (*d*) the—

Videan nerve: this passes backwards through the pterygoid canal, and divides into two filaments: one of which joins the carotid plexus; the other enters the aqueduct of Fallopius, and joins the facial nerve. The submaxillary ganglion is situated on the lingual branch of the third division of the fifth; it resembles the ophthalmic ganglion in being composed both of organic fibres and fibres of the cerebro-spinal system. It receives a filament from the superior cervical ganglion of the sympathetic, which in its course to it accompanies the facial artery.

THE CERVICAL GANGLIA are commonly three—viz., the superior, middle, and inferior; the middle ganglion is sometimes wanting, or merely consists of a slight swelling of the nerve. The branches of the *superior* cervical ganglion are—

1. *Ascending.* To form the carotid plexus in the carotid canal.
2. *Descending.* To the middle cervical ganglion, also branches which form the *superficialis cordis* nerve.

3. *Anterior.* To communicate with the facial, lingual, pneumogastric, and glosso-pharyngeal nerves. The fine filaments which run along the external carotid and its branches are termed *nervi molles.*
4. *External.* To join the anterior branches of the four superior cervical nerves.
5. *Internal.* To join laryngeal nerves and pharyngeal plexus.

The *middle* cervical ganglion lies on the longus colli muscle, opposite the body of the fifth or sixth cervical vertebræ. It gives off—

1. *Descending.* Two or three filaments to inferior ganglion of neck.
2. *Descending.* Middle *cardiac* nerve, to the heart.
3. *External.* To anterior branches of the fourth and fifth cervical nerves.
4. *Internal.* To thyroid artery and gland, trachea, and œsophagus.

The *inferior* cervical ganglion is found between the transverse process of the last cervical vertebra and the neck of the first rib; it gives off—

1. *Ascending* and *descending* filaments to join the two neighbouring ganglia; a distribution which is found in all the other ganglia of the sympathetic, and therefore need not be noticed again.
2. *Internal* filaments to the pulmonary plexus, recurrent, and phrenic nerves.
3. *External.* To the nerves that form the axillary plexus. The rest of the ganglia of the sympathetic send off *external* filaments to join the corresponding branches of the spinal nerve.
4. *Anterior.* To form the *inferior* cardiac nerve.
5. *Arterial.* Which follow the internal mammary and subclavian arteries; a large plexus of nerves from this ganglion ascends on the vertebral, and may be traced even to the basilar artery.

The cardiac ganglion (*plexus cardiacus*, Haller) lies between the arch of the aorta and the bifurcation of the trachea, in close contact with the former, extending from the division of the pulmonary artery to the origin of the brachio-cephalic. It is rounded and elongated, from half to three-quarters of an inch long, sometimes more; its colour is that of mother-of-pearl. The appearance of a plexus which it presents is owing to the numerous branches

which it receives at its upper extremity and gives off at its lower. From this ganglion *three orders* of filaments are given off—

1. Filaments to join the pulmonary plexuses.
2. Arterial branches to the aorta, and large arteries given off from it.
3. Descending branches to the heart; these are disposed in *two* sets, which take the course of the coronary arteries, and are thence termed the *coronary plexuses.*

The *right* or anterior *coronary* plexus passes between the aorta and pulmonary artery, to be distributed on the right auricle and ventricle.

The branches of the *posterior coronary plexus* ramify on the inferior and posterior surface of the left ventricle and auricle. These nerves enter the muscular structure of the heart, and stimulation of them quickens its motion, just as stimulation of the vagus retards it.

THORACIC GANGLIA.—These are *twelve* in number, on either side, lying underneath the pleuræ, on the heads of the ribs. They furnish *communicating* branches to each other and to the intercostal nerves, *pulmonary* filaments to the plexus of that name, and *arterial* filaments to the aorta. The principal branches, however, are the *greater* and *lesser splanchnic* nerves. 1. The *greater splanchnic* nerve arises from the 6th, 7th, 8th, 9th, and sometimes 10th thoracic ganglia; it descends through the crus of the diaphragm, and joins the semilunar ganglion. 2. The *lesser splanchnic* nerve is dervied from the 10th and 11th thoracic ganglia; it passes through the crus of the diaphragm to join the renal plexus.

ABDOMINAL GANGLIA.—These may be distinguished into lumbral and sacral. The *lumbar* ganglia are usually five pairs, situated on the sides of the bodies of the lumbar vertebræ, near the psoas magnus muscle; beside communicating and arterial branches, they send off filaments to the various plexuses to be mentioned hereafter.

THE SACRAL GANGLIA are commonly three or four pairs, situate near the anterior sacral foramina; they send off filaments to the sacral nerves and hypogastric plexus. The last pair detach two filaments which pass obliquely inwards and form the *ganglion impar*, on the median line.

ABDOMINAL PLEXUS.—The various branches of the *abdominal ganglia*, being joined by the splanchnic and branches of the par vagum, form numerous plexuses for

the viscera of the abdomen and pelvis. 1. The *Solar Plexus* lies on the crura of the diaphragm and across the aorta, near the cœliac axis; in its meshes may be seen the *semilunar* ganglia. This plexus gives off, or, more properly speaking, is in close communication with, the *phrenic, gastric, hepatic, splenic, renal, spermatic,* and *mesenteric* plexuses, which accompany the vessels corresponding with their several names. 2. The *Hypogastric* plexus is a vast interlacement of filaments derived from the spinal and sympathetic nerves which surround the internal iliac arteries, and supply the different viscera of the pelvis.

These various ganglionic plexuses send fibres to various organs themselves containing plexuses or even ganglia, as the heart and alimentary canal.

The nerves which control the muscular coats of the blood-vessels are drawn from this system; they are termed vaso-motor. Many, too, regulate the action of various secretory organs, not only by acting on these vessels, but also on the cells or other secretory structures.

ORGANS OF SENSE.

The organs of special sense are commonly described as five in number—viz., the skin (or organ of *touch*); the tongue (*taste*); nose (*smell*); eyes (*vision*); ears (*hearing*). It must not, however, be forgotten that simple ordinary sensibility is also represented by touch. Thus, in parts ordinarily insensible we may have an acute perception of pain as in an inflamed bone. There is also nowadays recognised a muscular sense—that is to say, a sense of the position and condition of the muscles in contraction, whereby we are able to move our feet in walking, &c. without looking at them to see how they are placed, as well as to perform many other like movements.

THE SKIN, OR ORGAN OF TOUCH.

The skin is the external integument which covers the whole body, and is continuous with the mucous membrane, and with the lining of the ducts of the secreting glands.

The structure of skin and of mucous membrane is identical, although the component parts are differently modified in different situations. The most external layer is called *cuticle* in the skin, and *epithelium* in mucous membrane. Under this lies a membrane whence the cells

grow, sometimes called *basement membrane;* and this again lies upon a more or less dense layer of areolar tissue, called in the skin the *cutis vera*, permeated by blood-vessels, which are generally most abundant on its surface immediately under the basement membrane. Besides these the skin possesses *sweat glands, sebaceous follicles, hair*, and *nail*, and *minute papillæ*.

The cuticle or epidermis is composed of an immense number of minute scales agglutinated together, which are being perpetually worn off from the outer surface, and as perpetually formed from below by the cutis vera. The newest layer of cells, which are in immediate contact with the cutis vera, are softer, rounder, and different in some chemical respects from the outer ones, which have become harder and flatter. The innermost layers of cuticle where it is the softest, are called the *rete mucosum*, and it is in these layers that the pigment is found which causes the dark tint of negroes and of dark complexions in general. The pigment seems to lose its tint as it approaches the surface. The outer surface of the epidermis exhibits its cellular constitution, the papillæ and apertures of the sebaceous and sudoriferous glands; on the inner surface are seen the funnel-like ducts of these.

The *cutis vera* is formed of a more or less dense web of white and yellow connective tissue fibres, which is united by ramifications with the subcutaneous areolar tissue, and often with the fascia beneath. The thickness of this part depends on the amount of pressure it has to withstand, and the thickness of the cuticle is in the same proportion. The vessels and nerves of the skin pass through it to ramify on the surface.

The *papillæ* of the skin are minute elevations of its surface (about 100th of an inch long) found wherever the sense of touch is most delicate, as on the fingers, where they exist in curved double rows. They are composed of a capillary artery and vein, forming a loop, with a portion of connective tissue; a nervous loop probably exists in all of them. They are covered with an expansion of the basement membrane, and over that with a cuticle, which is often moulded into ridges corresponding with the rows of papillæ.

The *sweat glands* lie thickly under every part of the skin, especially in the axilla. They are lodged in little foveolar depressions on the deep surface of the skin, and are of pink colour and semi-transparent appearance. Their ducts pass through the cutis and cuticle in a spiral

form; and their orifices are easily discernible in the fingers, in the cross grooves which intersect the rows of papillæ. They are composed of an involution of basement membrane, in the form of a tube rolled up into a little ball; and are lined with an epithelium continuous with the cuticle. When the cuticle is stripped off from the cutis vera, the minute ducts of the sweat glands can often be seen to be drawn out from the latter.

The *sebaceous follicles* are little acinous glands secreting a fatty matter, found most abundantly in the nose, lips, scrotum, &c.

The hairs and nails are modifications of the cuticle.

THE ORGAN OF TASTE.

The tongue has already been referred to. It is the chief organ of taste; the special nerves of this sense being the lingual of the fifth, and the glosso-pharyngeal. The branches of these mainly terminate in the papillæ already referred to. There are but four simple tastes—salt, sour, sweet, and bitter. What is called flavour is a mixture of taste and smell, and depends on the connexion between the mouth and nostrils. If that is stopped only the simple tastes are appreciable.

THE NOSE, OR ORGAN OF SMELL.

The whole cavity of the nose is subdivided into two lateral portions by the vomer, perpendicular plate of the ethmoid, and cartilage. Each nostril is further separated by the *spongy* or *turbinated* bones into superior, middle, and inferior *meatus*. The following are the openings into the nasal cavity: into the *superior meatus* open the posterior ethmoidal cells and the sphenoidal sinuses; into the middle meatus open the anterior ethmoidal cells, the frontal sinus, and the antrum; into the *inferior meatus*, we find the opening of the nasal duct: in addition to these the nose communicates externally with the atmosphere through the nostrils, and internally with the pharynx through the posterior nares; hence, when a person weeps, acts of deglutition are often observed, because the tears escape through the lachrymal points into the nasal duct; thence into the inferior meatus, and from the meatus pass through the nasal fossæ into the pharynx. The cavity of the nose is lined

throughout by the *pituitary* membrane, and receives branches from the olfactory nerve, which supplies the sense of smell, and from the first and second divisions of the fifth, which supply common sensation. The special organ of smell is situated in the upper part of the nasal cavity, and consists of a cylindrical epithelium, between the cells of which are ranged long and nearly naked processes of the olfactory nerve. This termination of the special sensory nerves in rod-like bodies, is typical of most of the other special senses.

THE EYE, OR ORGAN OF VISION.

The *eye* is contained in a cavity of the cranium, called the *orbit*, which is composed of the frontal, superior maxillary, malar, ethmoid, sphenoid, lachrymal, and palatine bones. The muscles enclosed in the orbit are, the levator palpebræ superioris, the four recti, and two oblique muscles. The nerves of the orbit are, the second, third, fourth, the first division of the fifth (*ophthalmic*), and the sixth nerve.

The *globe* of the eye is composed of fluid and solid parts enclosed in certain membranes, or tunics. The latter are, the sclerotic, the choroid, and the retina.

The *sclerotic* coat is a strong fibrous membrane, enclosing nearly four-fifths of the eye, and united anteriorly to the cornea in a bevelled manner. Its inner surface is in contact with the choroid membrane. The external surface of the sclerotic is covered anteriorly by the conjunctiva and expansion of the tendons of the ocular muscles. It is penetrated posteriorly by the optic nerve and central artery of the retina, and on the sides by the ciliary nerves and vessels.

The *cornea* is a transparent membrane, nearly circular, attached to the sclerotica, and forming the anterior portion of the eyeball. It is composed of a peculiar form of connective tissue, in which are numerous cavities communicating by canals and containing corpuscles, similar in many respects to leucocytes. It is lined anteriorly by a very thin layer of conjunctiva, and posteriorly by the membrane of the aqueous humour.

The *choroid* is a structure mainly vascular; but also where it covers the retina, consisting of pigment cells, generally hexagona lin outline. The *choroid* membrane is placed between the sclerotic membrane and the retina,

being continuous anteriorly with the ciliary ligament, where it is thrown into longitudinal folds, called the *ciliary* processes.

The *iris* is a kind of septum, placed vertically in the midst of the aqueous humour. Circular and flat, it separates the *anterior chamber* of the eye from the *posterior chamber*, which is limited behind by the crystalline lens. In the centre of the iris, an aperture called the *pupil* exists, its dimensions varying according to the light. The *anterior surface* of the iris is covered by the membrane of the aqueous humour; its *posterior surface* has received the name of *uvea*, and is covered with black pigment.

The iris partly consists of muscular fibres, two sets of which are generally described—an outer, *radiating*, and dilating the pupil; an inner, composed of *circular* fibres, which contract the pupil in the manner of a *sphincter*. In the fœtus, up to the seventh month of gestation, the pupil is closed by a membrane (*membrana pupillaris*).

The nerves of the iris are the ciliary, derived principally from the ophthalmic ganglion. It has been proved by experiments that the *motor* power of the ciliary ganglion and nerves is chiefly derived from the third nerve, and that the light does not cause the contraction of the pupil by acting directly on the ciliary nerves, but that irritation of the retina and optic nerve acts immediately upon the brain, and from the brain is reflected upon the third nerve and the short motor root of the ciliary ganglion. The long root of the ciliary ganglion, from the nasal branch of the fifth, supplies the interior of the eye with *sensibility*. The *nutrition* of the eye is under the influence of its nerves; for if the internal division of the ophthalmic nerve be cut the eye is destroyed. Paralysis of the cerebral fibres causes dilatation of the pupil. The same follows on irritation of the sympathetic, whilst section of that nerve causes contraction.

The *anterior chamber* of the eye is the space comprised between the anterior surface of the iris and the cornea; the *posterior* chamber is the space situated between the iris and anterior surface of the lens. The *aqueous humour* is contained in both these chambers; it is a clear fluid, very readily reproduced when evacuated. The membrane of the aqueous humour lines the anterior chamber.

The *vitreous humour* is a semi-fluid transparent body contained in the spaces of a kind of membrane, situated

behind the lens. It is in contact with the inner surface of the retina, anteriorly two layers of membrane embrace the crystalline lens. There results from this separation a space of the form of a three-sided circular prism, completed by the circumference of the lens; this is the *canal of Petit*.

The *crystalline lens* is situated at the union of the anterior with the two posterior thirds of the eye, lying behind the iris, surrounded by the ciliary processes, and received into a cavity of the vitreous humour. The crystalline lens, which is perfectly transparent in the adult, is a little reddish in the fœtus, and yellowish in old persons. Its softness diminishes as the age advances. The *capsule* of the lens has a form similar to the body it contains; it is composed of fine connective tissue.

The *retina* is a transparent membrane which lines the inner surface of the choroid, and is continued as far forward on the vitreous humour as the ciliary processes. It is composed of various layers of nervous origin supported by fine connective tissue. Most internally is the membrana limitans, just beyond this a layer of nerve-cells from which proceed various processes terminating in the rods and cones of Jacob's layer. It is supplied by the *arteria centralis retinæ*, a minute branch of the ophthalmic which runs in the centre of the optic nerve, and emerges from its termination to form this vascular network which lines the retina.

The appendages of the organ of vision are—the eyebrows, eyelids, and lachrymal apparatus. The lachrymal apparatus consists of the lachrymal gland and caruncle, the lachrymal ducts and sac, and the nasal duct.

Physiology of Vision.—The rays of light from any given object are collected by the cornea, in consequence of its forming a concavo-convex lens, and are directed towards the interior of the eye. Some impinge upon the iris, and are by it intercepted. The greater number pass through the pupil, and are concentrated by the double convexity of the crystalline lens; they pass backwards from its posterior surface through the vitreous humour, and here diverging form the image of the object on the retina. The direct or vertical rays pass straight through the lens; the lateral rays in passing through the lens are made to converge so that an image of the object whence the rays proceed is formed in an inverted position on the retina. A too great convexity of the lens causes the

image to fall short of the retina, and insufficient convexity to form beyond the retina; hence the phenomena of near and far-sighted persons. These defects are remedied by the use of glasses, which correct the deficiency in the natural structure.

The accommodation of the eye for near and distant vision seems to be effected on a similar principle. In near vision the lens is compressed and made more spherical by the action of the ciliary muscle on its capsule. This requires an effort, and tires the eye. Normally the eye seems set for distant vision, the lens being subjected to little or no compression. The sense of solidity seems to be due to the double picture given by the two eyes, one seeing the object from one point, the other from another.

THE EAR, OR ORGAN OF HEARING.

This organ has been distinguished into three portions—the external, middle, and internal. The external ear includes a canal, the *meatus auditorius externus*, which leads to the membrana tympani. This canal is about one inch and a quarter in length, is slightly convex in the centre, and is directed forwards; it is composed of cartilage, deficient anteriorly, and is lined by mucous membrane, covered by epithelium. In this is a number of sebaceous follicles, which secrete the wax of the ear. The *middle* ear, or *tympanum*, is a small circular cavity flattened at its sides. Externally it is bounded by the *membrana tympani*. This membrane is composed of three layers; an external one continuous with the skin lining the meatus; an internal one, continuous with the mucous lining of the tympanum, and a middle, composed of elastic fibres. It is placed obliquely, so that its aspect is outwards, downwards, and forwards. The *malleus* is attached to its inner surface.

On the inner wall of the tympanum may be observed a little projection called the *promontory;* above this an oval opening, closed by a membrane to which the base of the stapes is attached; this is the *fenestra ovalis*, and communicates with a part of the internal ear, called the vestibule. Under the promontory is a small round hole (*fenestra rotunda*) communicating with the *scala tympani*, and closed by membrane.

On the posterior wall are seen the openings into the *mastoid cells*, below which is a hollow projection, the *pyramid*, containing the *stapedius* muscle; and below

that the *apertura chordæ* by which the chorda tympani nerve comes from the Fallopian canal.

The floor of the tympanum displays the *glenoid fissure* through which the *processus gracilis* of the malleus passes to give insertion to the musculus externus mallei or laxator tympani, and the chorda tympani also escapes.

The anterior wall displays one orifice, divided into two by the *processus cochleariformis;* the upper partition contains the tensor tympani, or internus mallei muscle; the lower is the tympanic extremity of the Eustachian tube.

The tympanum contains four bones (*ossicula auditus*), articulated in moveable fashion the one to the other, which stretch in an irregular chain from the membrana tympani to the fenestra ovalis. First, the *malleus*, which is attached to the membrana tympani; secondly, the *incus*, articulated with the malleus; thirdly, the *os orbiculare;* and fourthly, the *stapes*, articulated on the one side to the os orbiculare, and on the other attached to the *membrana fenestræ ovalis.*

There are three muscles of the tympanum, which regulate the motions of the ossicles, and stretch or relax the membrana tympani, and membrana fenestræ ovalis.

The Eustachian tubes open from the tympanum into the upper part of the throat opposite the posterior extremity of the inferior spongy bone, and thus convey air into the cavity of the former, and allow the membrana tympani to vibrate freely. When these tubes are filled with mucus, or obstructed from disease of the throat, the hearing is always impeded.

The *internal* ear, or *labyrinth*, is subdivided into the vestibule, cochlea, and semicircular canals. The *vestibule* is the minute cavity contained between the fenestra ovalis, the cochlea, and the entrances to the semicircular canals. The vestibule is lined by a membranous expansion, which contains a peculiar fluid (*liquor Cotunnii*). The openings into the vestibule are—(1) the fenestra ovalis; (2) the opening into the cochlea; (3) the five openings of the semicircular canals; (4) the aqueduct of the vestibule; (5) the openings for the entry of the portio mollis.

The *cochlea* is a small osseous structure, which somewhat resembles the shell of a snail, from which similarity it receives its name. It consists of an osseous tube, twisted two and a half times round a central axis (*modiolus*). The *lamina spiralis* is a thin plate, partly

bone, partly membrane, which winds round the axis, and thus divides the general cavity into two portions, denominated scalæ; one of these (*scala vestibuli*) communicates with the vestibule, the other (*scala tympani*) with the tympanum, by means of the fenestra rotunda. In the membranous portion of this structure is situated the organ of Corti, composed of rod-like expansions of the auditory nerve, and which are mainly concerned in hearing.

The *semicircular* canals are three in number—two vertical and one horizontal; they open, as has been said, by five orifices into the vestibule, for the two vertical open by a common foramen, at one extremity; at their orifices are seen the *ampullæ*, or dilatations; corresponding with the terminations of the auditory nerve. The *portio mollis* of the seventh nerve supplies the ear, and is the true acoustic nerve. This nerve, having entered through the bottom of the meatus auditorius internus, is partly distributed to the vestibule and semicircular canals, and partly to the cochlea, in the form of loops and membranous expansions.

Physiology of Hearing.—Sound is produced by the vibrations of the air, or of solid or fluid bodies, caused by the contact of various agents. These vibrations are conducted by the *external ear* along the meatus auditorius to the membrana tympani, which is thrown into corresponding vibrations; these are communicated by the chain of small bones in the *middle* to the *internal* ear, where they impress themselves on the expansion of the auditory nerve, and are thus conveyed to the sensorium. The *Eustachian tube* permits of the passage of the air to and from the middle ear, and thus permits of free vibration of the membrana tympani.

GENERATION AND DEVELOPMENT.

In all beings, animal or vegetable, where sexual generation is the rule, the essence of the generative act may be said to be the bringing in contact two highly specialized products. The one developed by the male is termed the spermatic or seminal element; that generated by the female the ovular element or ovum. These are produced by certain organs set apart for the purpose, and are not developed until the individual has arrived at or near maturity.

The testes, which are the seminal secreting bodies, are

composed of minute tubes (*tubuli seminiferi*), extremely convoluted, and arranged in lobules (*lobuli testis*). These tubes terminate in the *vasa recta*, a series of small, straight vessels which join the *rete testis*. The ducts forming this latter body emerge from the superior and posterior angle of the testis, under the name of *vasa efferentia* (coni vasculosi), which are commonly from ten to fifteen in number; these soon become convoluted, and, joining together, form the *epididymis*. The upper end of this last-named tube is called *globus major*; the lower part *globus minor*; and the duct which ascends from the latter to the ring is denominated *vas deferens*. The *proper tunics* of the testicle are, the tunica vaginalis, tunica albuginea, and tunica vasculosa. The *tunica vaginalis* is the serous bag which was drawn down with the testicle in its descent from the abdomen. The *tunica albuginea* is a dense fibrous membrane, which forms the proper capsule of the testicle: at the posterior border of the gland, this membrane divides into two laminæ, one of which, the external, is continued along the vas deferens; the other, internal, joining with the layer of the opposite side, passes into the substance of the gland. The septum thus produced is called the *corpus Highmorianum* (*mediastinum testis* of Sir A. Cooper). The tunica albuginea also sends in several processes, which separate the lobuli testis. Sir A. Cooper also describes the *tunica vasculosa testis*, which lines the inner surface of the tunica albuginea, and sends vascular processes between the lobules.

The *spermatic cord* is composed of the vessels, nerves, lymphatics, and ducts coming to, and passing from, the testicle, enclosed in four membranous layers—viz., the spermatic fascia, the cremaster muscle, the fascia propria, and the remnant of the *tunica vaginalis of the cord*. The *vas deferens* ascends from the globus minor of the epididymis, along the cord; then passes through the inguinal canal, turns downwards along the posterior wall of the bladder, across the ureter, and terminates by uniting with the duct of the vesicula seminalis at the base of the prostate gland. The semen is a semi-opaque fluid of a dull white colour, and contains certain bodies termed spermatozoa, resembling a pin in shape, the head being oblong, and the tail tapering gradually to a fine point. These are the essential agents in fecundation.

In the female, the essential body concerned in reproduction is the ovum, which is produced in the ovary,

whence it is conveyed by the Fallopian tubes to the uterus. If fecundated by spermatozoa, it then undergoes development ending in the production of the infant, at the time of expulsion ready to maintain an independent existence.

The *uterus* is a muscular pyriform body, situated between the bladder and rectum, and connected to both by the peritoneum. It is united laterally to the sides of the pelvis by the *ligamenta lata*—broad folds of the peritoneum, reflected from the anterior and posterior surfaces of the organ. They contain the Fallopian tubes, round ligaments, and ovaries. The uterus is also supported by two *round ligaments*, which pass from its angles to the internal abdominal rings, traverse the inguinal canals, and become fixed in the substance of the labia majora. The uterus is distinguished into a neck, body, and fundus. The *neck* (*cervix uteri*) is the elongated portion which projects into the vagina. It is slightly flattened from before backwards, and is from ten to twelve lines in length, by eight to ten in breadth. The inferior margin presents a transverse slit (*os uteri*), bounded by two lips, of which the posterior is the longer and thicker. The *body* of the uterus is nearly two inches in length, and is placed between the bladder and rectum. The upper rounded margin of the uterus is called the fundus. The *cavity* of the uterus is small in proportion to the bulk of the organ. It is of a triangular shape, and is lined by a continuation of the mucous membrane of the vagina. The *proper tissue* of the uterus is muscular, but the muscular fibres can only be well seen in the uterus at the full term of gestation; they run principally from the fundus towards the cervix, and there are also distinct concentric circles surrounding the body of the uterus. The irregular contraction of these latter fibres produce, probably, what is called hour-glass contractions of the uterus.

Each ovum contains a germinal vesicle and a germinal spot. After fecundation the germinal vesicle divides and subdivides continuously until the ovum is filled with a granular-looking substance, the mulberry mass. From this is developed the embryo. The first trace laid down is in the dorsal region, and presently three well-marked layers are produced—viz., the serous, mucous, and vascular. From the first, which is the most external, are developed the cerebro-spinal canal, with its contents and coverings, as well as the ribs and walls of the abdomen.

From the mucous layer are developed the viscera of the chest and abdomen, excluding the heart and its connected vessels, which are developed along with their earliest contents from the intermediate or vascular layer.

Whilst development is going on certain folds of membrane gradually encompass the embryo. The most important of these is the amnion, in which it floats. From its posterior extremity grows a mass of cells called the allantois, which, growing outward, reaches the walls of the uterus, next its vessels, penetrate these until they have reached the maternal vessels, whence they draw supplies of nourishment for the fœtus. Thus is formed the placenta. The communication between the fœtal and maternal vessels is not direct. The various organs of the body are formed by buds from the central mass, which originally consists only of the trunk and head. After parturition, the infant, which heretofore has breathed and been fed by the blood from the mother's vessels, begins to respire by the lungs, and is nourished by a peculiar secretion specially intended for this purpose—viz., milk, which is the secretion of the mammary gland.

The *Fallopian tubes* are two membranous canals, which extend from the sides of the uterus, along the broad ligaments, towards the ovaries. The free extremity of each is wide, and presents a peculiar fringed appearance, whence their name, *corpora fimbriata*. These receive the ovum from the ovary, and conduct it to the uterine cavity. The Fallopian tubes are composed of a thin layer of erectile tissue, lined internally with the mucous membrane, which is thrown into longitudinal plicæ, and externally with a prolongation of the peritoneum. The serous membrane, however, is not reflected back from the fimbriated bodies, and hence presents a communication with the exterior—in other words, is not a complete sac.

The *ovaries* are oblong bodies contained in the posterior folds of the broad ligament. Each is connected to the uterus by the broad ligament, and by a small fibrous cord, without a canal, the ligament of the ovary. The ovary is moreover enclosed in a dense fibrous sheath, which sends septa into its structure: when this is divided, the ovary is seen to contain a number of small vesicles (*vesicles of Graaf*), in which are developed the ova, or rudiments of the embryo. After conception, the ovaries frequently present yellow spots (*corpora lutea*).

THE MAMMARY GLAND.—Although, strictly speaking,

not one of the organs of generation, this is the most appropriate place for a description of this gland. The mammæ, or mammary glands, are situated one on each side of the female breast; they are hemispherical in shape, and about four inches in diameter.

Nearly in the centre, but rather to the inner side, is the nipple, composed of erectile tissue, covered with delicate skin, and containing the openings of the lactiferous tubes. This is surrounded by the areola, a darkish circle of integument, provided with sebaceous follicles. The mamma is composed of about twenty distinct lobes, each of which is provided with a separate duct. The lobes are composed of numerous milk tubes, more or less dilated at intervals.

THE MILK.—The ordinary character of human milk need not be described. It consists, like other animal milks, of a fluid and solid portion. When recent, and examined under the microscope, it is seen to contain a number of small globules, floating in the liquid, the ordinary milk globules, composed of fatty matter, and larger globules of a yellowish colour, the "*colostrum corpuscles.*"

THE FŒTUS.

The average length of the fœtus at birth is about nineteen inches, and its weight from six to seven pounds. The head and abdomen are remarkably large in proportion to the rest of the body.

The circulating system of the fœtus presents the following peculiarities:—

1. The two auricles of the heart communicate by means of the *foramen ovale.*

2. The pulmonary artery opens into the descending aorta by the *ductus arteriosus.*

3. The internal iliac arteries give off two large anterior branches (the *umbilical*), which ascend along the anterior wall of the abdomen, pass out through the umbilicus, and are connected by the cord to the maternal placenta.

4. The umbilical vein is connected to the inferior vena cava by a branch called the *ductus venosus.*

The above-mentioned peculiarities of structure necessarily occasion corresponding peculiarities in the mode of the fœtal circulation. The blood is carried from the placenta by the *umbilical vein,* partly to the liver, and partly, through the means of the *ductus venosus,* to the

inferior cava; that portion which circulated through the liver is also carried to the inferior cava by the hepatic veins, and meets the blood returning from the lower extremities. The blood of the inferior cava, having been discharged into the right auricle, is guided through the foramen ovale by the Eustachian valve into the left auricle. Thence it passes into the left ventricle, and subsequently into the aorta; and this, which contains the blood which has last come from the placenta, is chiefly distributed through the branches of the arch of the aorta to the head and the upper extremities. The blood of the superior cava passes into the right auricle, from the right auricle into the right ventricle, and from this latter cavity into the pulmonary artery; but instead of circulating through the lungs, as it does in the adult, the blood contained in the pulmonary artery passes, through the *ductus arteriosus, into the descending aorta;* the rest is merely sufficient for the nutrition of the pulmonary apparatus. The descending aorta conducts the blood, as in the adult. A small portion is distributed to the lower extremities, but the greater part, having entered the *umbilical branches* of the internal iliacs, is carried along the vessels of the cord to the placenta.

After birth, the foramen ovale and ductus arteriosus become closed, and the umbilical vessels, together with the ductus venosus, are converted into fibrous cords.

PART II.

PRACTICE OF MEDICINE.

The various maladies or pathological states here discussed are, as far as possible, arranged in the same order as are the various physiological functions of the body in the former part of the work.

DISEASES OF THE ALIMENTARY CANAL.

DISEASES OF THE MOUTH, PHARYNX, AND ŒSOPHAGUS.

CATARRH OF THE MOUTH—STOMATITIS.

Superficial inflammation, or, as it is also called, catarrh of the mucous membrane of the mouth, may arise from the local action of irritants, such as mercury, or by the spread of the inflammatory condition from neighbouring organs, especially from the stomach and skin of the face. There is swelling of the mucous membrane on the tongue and cheeks; the mucus secreted is unusually thick and turbid with young cells, so that it adheres freely to the tongue, especially to the papillæ, giving rise to what we commonly call a foul or coated tongue. The thickened epithelium and new cells tend to rapid fatty degeneration or putrefactive change, whence the breath, if the patient breathes through the mouth, is foul and unpleasant, but is sweet enough if the patient breathes by the nose—an important distinction. In the chronic form, the epithelium and mucous follicles may be even more swollen than in the subacute condition we most frequently see. The patient complains of a bad taste in the mouth, or it may be only a loss of the sense of taste to some extent; whilst the secretion is so thick and clammy that it cannot be got rid of by hawking and spitting. There is ordinarily, too, considerable thirst, for the common concomitant of oral catarrh is gastric catarrh. This is always most troublesome in the morning, and often disappears after breakfast, when the excessive fur has been removed from the tongue.

Treatment.—When oral catarrh is due, as is not unfrequently the case, to over-smoking, that must be stopped,

or only indulged in to a moderate extent. So too of the variety of the malady arising from the excessive use of alcohol. When the disease has been produced by the prolonged use of mercury, that must be discontinued and cooling gargles given. Sucking crystals of chlorate of potass is one of the best remedies. The oral catarrh of some acute diseases, coupled with decaying particles of food, renders the mouths of patients who lie with their mouths open excessively fœtid. This is best remedied by swabbing out the mouth well with permanganate of potass and water in weak solution, or by driving sulphurous acid of pharmacopœal strength into the cavity in the form of spray. In stronger individuals a solution of bicarbonate of soda will be found useful for cleansing purposes; but where the malady becomes chronic, more powerful astringents may be required, than which there is nothing better than light pencilling with a stick of nitrate of silver.

APHTHOUS STOMATITIS.

The term *aphthæ* is given to small white spots on the surface of the oral cavity, which when seen early look something like vesicles, but are solid. They are surrounded by a red border, and soon the white portion becomes yellow and sloughs away, leaving an excoriation of the surface. Often they run into one another, forming irregular figures, whilst the rest of the mouth being in a condition of ordinary catarrh, the saliva is unusually abundant and viscid. Aphthæ are most frequent in children soon after birth, especially if reared by hand, and again later during the period of dentition. The child is feverish, and the mouth is too painful to allow of food being taken, whilst from accumulated débris the fœtor may be considerable. Later in life aphthæ may occur in acute diseases like typhoid, or in the last stage of lingering disorders in old people.

Treatment.—The favourite remedies for this condition are—a mercurial purgative and an application of borax and honey; but what is far better, is to put some crystals of chlorate of potash in a clean piece of linen, tie it up tightly, and give it to the child to suck. If there is no great epithelial accumulation, rubbing the inside of the mouth with the finger after dipping it in glycerine of tannin will generally do good. Adults can suck chlorate of potash, or have its solution in spray.

CANCRUM ORIS.

This form of disease is now happily but rarely seen except in unhealthy and badly fed scrofulous children, especially in pauper schools, but when the extravagant use of mercurials was in vogue for the treatment of rickets and hydrocephalus, it was only too frequent. It sometimes occurs in adults. The malady begins by the formation of a white or yellowish spot of some size on the inside of the cheek, and on the gum opposite. This sloughs, and a raw irritable sore is left, which is very painful. In more severe cases the slough is thicker and the ulcer deeper. In either case healing proceeds but slowly, and in the worst form there is no tendency to it at all. Lips, cheeks, and tongue may be all involved, and in the worst cases there is caries or necrosis of the jaws. Here too, there is catarrh of other parts of the mouth, so that what between the sloughing tissues and the decaying epithelium the odour is exceedingly disagreeable. In the advanced stage we see a dark, ashen-coloured opening on the outside of the cheek, occupied by a pulpy-looking material, the edges blackened and the surrounding tissues œdematous. Inside the mouth matters are still worse, the gangrenous condition is more extensive, the teeth loosened and the jaw-bones laid bare, and the odour horribly fœtid. In such instances death usually results; but in simpler cases, though recovery is slow, it is at last attained, but with more or less deformity following cicatrization.

Treatment.—In cancrum oris dependent on mercurials their use ought to be promptly stopped, and all the remedies useful in ptyalism invoked. Chlorate of potass, as already pointed out, is one of the chief of these. Iodide of potassium in five-grain doses should be given every four hours in decoction of bark, and the patient have port wine and egg. The mouth is to be kept clean in the usual way, and carefully washed out after eating, as the condition is greatly aggravated by decaying particles of food. The mouth is usually kept half open to relieve the pain, and this fosters the decomposition. As any motion of the jaws is extremely painful, all the food should be in the condition of a moderately thin pulp, and should be rich and nutritious. As the slough clears away, the part should be lightly touched with solid nitrate of silver—this is much better than playing with a solution of it. Sulphurous acid and permanganate of potash are also very

useful. In the pauper form of cancrum oris good food and stimulants are still more essential. If the ulcer shows any disposition to heal, cod-liver oil should be administered.

ULCERS OF THE MOUTH.

Ulcers of the mouth are of two kinds—simple and specific. The simple breaches of surface arise from causes already discussed, or from stopping up of the small mucous follicles, from herpes, or from small-pox. Sometimes the point of the tongue is found raw, red, and very painful; there is, however, no breach of surface, and the insides of the teeth will commonly be found roughened by tartar. These irritated spots are very painful while they last, but require no treatment beyond removal of their cause. Similar in some respects, but more severe, are the ulcers on the edge of the tongue produced by a sharp-edged hollow tooth. These too get well when the irritation is removed.

Syphilitic ulcers of the mouth are of two kinds—primary and secondary. Primary chancres are not very common, and it is important to recognise the fact that they may be acquired in the most innocent manner. A syphilitic child may infect a nurse's breast, and thus other nurslings may become infected. Passing sweetmeats from child to child may have the same effect, as may cigars and pipes infect those of more mature years. Probably the chief sources of infection are the mucous tubercles which often form at the angles of the mouth, and the condylomata of the tongue in secondary syphilis.

Treatment.—Such sores, whether of the lips or tongue, must be dealt with in the same way as chancres elsewhere. The patient should always be warned of the risk of infecting others. The secondary ulcers are best treated by the application of the solid nitrate of silver, and weak lotions of corrosive sublimate. They are commonly associated with other symptoms of constitutional syphilis. The ulcers along the sides of the tongue which look like shallow depressions or deeper pits in its substance, are very painful, and interfere sadly with the movement of the organ. They too are best treated with lunar caustic.

The ulcers which arise from tertiary syphilis are quite different. Their most common site is the pharynx, the tonsils and soft palate, and the hard palate. They are not at all painful, and often a patient will have a hole piercing the soft palate, or that part almost entirely

destroyed, without being sensible of the state of matters. If seen early enough there is a deposit of yellow gummy material beneath the skin, and if this be not dealt with no long time elapses till both skin and deposit give way, and a deep, sharply-defined ulcer is left. This tends to penetrate more deeply rather than to heal, and if in the roof of the mouth soon involves the bone.

Treatment.—Fortunately such ulcers are highly amenable to treatment. The solid nitrate of silver should first of all be well bored into each—a light touch here is worse than useless—and time given for the slough to separate. Meanwhile sulphurous acid or chlorate of potash should be freely used for the general catarrh of the mouth, and iodide of potassium given in large doses. It is best given in bark along with carbonate of ammonia, and is useless in small doses. It is good to begin with 10 or 15 grains every four hours, and to increase the dose if necessary. In many instances no time is to be lost if we would avert irretrievable mischief, such as destruction of the hard palate, or even of the vertebræ.

THRUSH.

The disease called thrush is ordinarily seen in infants only a few days or weeks after birth, but sometimes also towards the close of wasting diseases. It tends to spread from one child to another if great cleanliness be not observed, especially where they are congregated together in large numbers. Associated with the disease, if not the immediate cause of it, is a fungus, the *oidium albicans*, but such fungi may nearly always be found in the oral cavity, especially in catarrhal conditions. The thrush is seen to form whitish points or smears of a curdy-looking appearance on the tongue and cheeks, and this is found to be formed of the fungoid elements already mentioned in the shape of spores and mycelium with partially disintegrated epithelium. Usually, this condition of mouth is associated with diarrhœa, but both are due to the same cause, not the one to the other. The malady is not dangerous in otherwise healthy children, but in weakly infants the diarrhœa may be exhausting.

As to accompanying *treatment*, the malady, as far as the curdy smears are concerned, being essentially fungoid, we should use those remedies which are known to destroy such

parasitic growths. Chief among these is sulphurous acid or sulphite of soda in simple syrup, with which the inside of the mouth may be smeared, or the same agents may be made use of as spray. The diarrhœa must be treated as usual if the child is brought up by hand; lime-water should be added to its milk, to which also a little compound powder of chalk may be added. Cleanliness is the chief means of avoiding the malady; the child's mouth should invariably be washed out after food, especially if artificial, thus preventing any decomposition of unswallowed particles.

GLOSSITIS.

By glossitis is meant acute inflammation of the tissues of the tongue, and not of its surface only. It is most frequently produced by irritant substances, by corrosive fluids, stings of wasps, or is one of the results of salivation. The inflammation usually begins at the tip and spreads backwards, the tongue being red, swollen, and painful, often protruding from the mouth. In most cases it speedily returns to the ordinary size, but in some the organ remains permanently enlarged. Abscess is rare. Speaking and swallowing are greatly interfered with; the saliva runs from the mouth whilst the surface of the tongue is dry. Breathing is sometimes greatly impaired by pressure of the swollen tongue against the larynx, and death may result from this cause. The glands at the angle of the jaw are also enlarged. Partial inflammation of the tongue is a much less formidable malady; it may result from jagged teeth, or any similar irritant. The tongue becomes indurated at the point of irritation, and its motions are painful and impeded.

Treatment.—In acute inflammation of the tongue the treatment is well established. The tongue is to be incised along its margin, the depth and extent of the incision depending on the acuteness of the malady. Ice should be applied after the organ has bled well. If suffocation threatens, tracheotomy must be performed. Persistent enlargement of the tongue may give rise to impairment of function; in such cases compression may be of some use.

SORE THROAT—CATARRHAL, PHLEGMONOUS, AND ULCERATIVE.

Simple sore throat, meaning thereby an inflammation of the tonsils, soft palate, and upper part of pharynx, is a common enough malady. It occurs much more frequently

in some patients than in others. These can hardly undergo the slightest exposure without being subjected to an attack of this malady, and one attack seems to predispose to another, especially if the parts are left in a damaged condition. In some it becomes chronic, and can with difficulty be got rid of. The most frequent cause of catarrh of the fauces is exposure to cold, especially in debilitated subjects if these have been subjected to draughts of cold air or wet clothes; but it may be produced by direct irritation, or may spread from neighbouring organs. Sometimes it appears to be the result of constitutional conditions, as in the sore throat of scarlet fever. Young people are more liable to its attacks than those more advanced in life.

The first sensation of *simple sore throat* may be merely a feeling of stiffness, and some pain, especially on swallowing. The fauces, on examination, are seen to be red and swollen, with a smooth, dry, velvety look, often more on one side than the other; the orifice between the pillars is narrowed, the uvula thick and swollen, club-shaped, often resting on the tongue. This gives rise to attempts at swallowing which are exceedingly painful, especially if the muscles be at all seriously implicated. The inflammation commonly extends both forwards and backwards, so that there is frequently catarrh of the mouth, and of the Eustachian tube, thus producing deafness and pain in the ear on swallowing. The larynx, too, may be affected, thus interfering with both voice and breathing. Not unfrequently there are to be seen patches which seem like false membrane, but these are easily removed without any breach of surface. Constitutional symptoms are always present, they vary greatly in intensity but are usually severe; they begin with some shivering or feeling of cold, followed by fever, thirst, and loss of appetite; the tongue is foul, and the breath fœtid, the bowels are confined, and the temperature over 100° Fahr., probably as high as 104° Fahr. Often in the very acute stage swallowing and articulation are exceedingly difficult, and food and drink may regurgitate by the nose. Such an attack seldom lasts long, especially if energetically dealt with; not so the chronic form.

In many patients the tonsils become permanently enlarged by repeated attacks of catarrh, and then the slightest exposure suffices to bring on a fresh attack. Here there is not so much redness but more swelling, the surface is covered with tenacious mucus, and perhaps

only a chink is left between the two tonsils, so that a view of the pharynx becomes impossible, the tonsillar glands close up, and the contents undergo fatty or even chalky change, finally escaping by sloughing, and leaving small ulcers behind. In yet other cases the posterior wall of the pharynx is that chiefly affected. Then its surface is rough and irregularly thickened, or its acinous glands undergo changes similar to those of the fauces. Sometimes these glandular ulcers unite to form a single large ulcerated patch; but this is not common. In the latter case the larynx is commonly implicated. The *chronic* form of the malady may thus be said to tend to two forms, the granular and the follicular or ulcerative, though mixed forms are common enough.

Treatment.—The treatment of sore throat in its various forms, though satisfactory, can hardly be called simple. The slighter forms require nothing, but the more severe require smart handling. You see a patient who has, perhaps, slept in a draught of cold air. He complains of some pain, especially on swallowing; he is somewhat fevered, and his fauces are red, moist, and injected. In most cases, this condition may be speedily overcome thus:—Paint the injected fauces with a strong solution of nitrate of silver, or touch the parts lightly with the solid stick after dipping it in warm water. If the fever be high, put the patient in a warm bath, and thence remove him straight to bed; if there is less fever, let him put his feet in hot water and mustard, and assiduously gargle his throat from time to time with water as hot as can with comfort be borne. Between times let him inhale the steam of hot water, and keep a cold water compress round the throat. The food is to consist of slops, and a saline purgative should be given. This will speedily, as a rule, arrest even sharp attacks of inflammation. In slighter cases, hot-water gargles and steam, with the cold compress, will suffice; and in others still, a towel wrung out of cold water and applied to the throat with a good layer of flannel over all during the night, to be followed with a good sousing in cold water in the morning, will soon put all to rights.

In certain *subacute* forms of sore throat œdema of the parts is the most prominent symptom. Here such treatment is not to be followed—astringent gargles of alum, of tannin, or of glycerine and tannin are to be used.

But, again, we see a patient some days after the attack has begun. He can hardly open his mouth for pain,

swallowing has become quite impossible, the tongue is thickly coated, and the breath extremely fœtid; the tonsils are swollen, dark red, and covered with a glutinous exudation; the patient can hardly speak, and with still more difficulty swallow; his temperature is perhaps as high as 104°. When such is the case we can hardly hope to arrest the disease, but we can try. The mouth should be well cleaned out by sulphurous acid or permanganate of potass, and the tonsils examined. If there is any pus in them, let them be opened at once with a knife covered with lint close up to its point, and cutting towards the middle line; it will save the patient much suffering. Even if there be no pus, the incision will relieve the swelling, and give ease to the patient. If not so managed we need expect little relief till the parts open of their own accord, and the contained pus is discharged. After this a slightly astringent lotion and strengthening medicine will suffice for complete recovery.

In chronic inflammation of the tonsils we may try all kinds of remedies—glycerine of tannin, tannin, or alum in powder, even burnt alum, and the strong liq. ferri perchloridi, locally with no avail. Enlarged tonsils do not themselves cause much trouble, though by implicating the Eustachian tubes they may give rise to deafness, and the subjects generally suffer from dyspepsia, which is perhaps helped by swallowing the unhealthy secretions. But such patients are continually subject to sore throat on the slightest exposure, and the best thing for them is to get rid of the tonsils by excision—by no means a formidable operation.

In ulcerated sore throat the treatment varies. We have already alluded to the management of the syphilitic forms; and with the exception of the internal use of iodide of potassium, we should employ the same kind of treatment in most other varieties. We have, however, a valuable auxiliary in the use of nitrate of silver in solutions of various strength applied as spray, or by a brush. These brushes are best made by tying a morsel of cotton wool to the end of a penholder, renewing the apparatus with each application. Liq. ferri perchloridi fort. applied in this way is a most efficient remedy. For the small follicular sores, glycerine of tannin is good, whilst for the purely syphilitic sores, a solution of corrosive sublimate, or of iodine in iodide of potassium is very good. Iodine dissolves in water by help

of the iodide, in the proportion of 1 of iodine to 2 of the iodide.

In the chronic form of sore throat, we must change our astringents from time to time, and alternate the use of them by the brush and as gargle, with the same remedy in form of spray. Frequently a change of air to a warm, dry climate is necessary.

RETRO-PHARYNGEAL ABSCESS.

This is a form of malady too often overlooked. We encounter it more frequently in young people than in adults. It depends on inflammation of the connective tissue behind the pharynx, which contains many lymphatic elements similar to those of the tonsils; often it is connected with disease of bone, especially caries of the vertebræ. If the pus collect to any extent, it may press the back of the pharynx forward, and so interfere greatly with both speaking and swallowing. This swelling which is found close behind the soft palate is tense, but soft and fluctuating. This should always be promptly opened by a hollow needle with a bit of tubing attached, for the abscess may not open of itself, or it may make its way downward and open in the chest, giving rise to fatal mischief. If opened, a simple case would be on the high road to cure, but of course the chance of caries has to be considered. If not made out, death is too often the result of what we may call sheer carelessness. If a child, especially when recovering from any form of acute disease where there is a tendency to form abscesses, begins to have difficulty in swallowing, with cough and breathlessness, if there is a tendency to choke on trying to swallow, and the child is hoarse and roupy, still more if its neck has been stiff, the pharynx should be carefully examined. Then if the tense fluctuating tumour be found, it should be promptly opened, and the child placed so as to allow the pus to flow freely from the mouth. With the canula and india-rubber tube chloroform may be used.

MALADIES OF THE ŒSOPHAGUS.

The œsophagus, like other portions of the body, may become the seat of various forms of inflammation; but of these there is no very marked sign save pain and difficulty in swallowing. They do, however, give rise directly

or indirectly to other and more serious conditions, especially to dilatation or stricture.

Obstructions of the œsophagus may be due to the pressure of tumours without its substance or in its substance, whilst strictures, properly so called, are for the most part of three kinds—simple, syphilitic, and cancerous. Simple stricture is most frequently due to inflammation with loss of substance and subsequent contraction, as after swallowing corrosive fluids; or irritation of the same kind acting more slowly, may give rise to thickening, especially of the submucous layer, and so interfere with muscular contraction. These strictures are most frequent in the lower third. They come on gradually but steadily, and the patient more and more loses the power of swallowing large morsels, and more and more the food tends to regurgitate. This regurgitation may not take place at once, but only after the food has accumulated to some extent. A bougie cannot be passed, and the patient gradually emaciates, and if not relieved dies of starvation; but in this form of the malady dilatation by graduated bougies is usually successful if persevered in. The syphilitic nature of strictures can only be made out by means of the past history, and the result of treatment by mercurials or iodide of potassium.

Unfortunately, the morbid growths of the œsophagus are too often cancerous and incurable. Epithelioma is comparatively rare, except in the upper part of the tube. True cancer begins in the submucous coat, and generally forms a continuous layer all round. Often these growths soften, and ulcerate both outwards and inwards, forming communications with neighbouring organs, especially the trachea. The diagnosis of cancerous obstruction rests chiefly on age, the absence of any other cause of stricture, pain, emaciation, and the peculiar cachectic appearance of cancerous subjects. Cancerous or bloody materials may also be vomited or brought up with food. Such cases are hopeless, and death is often very painful. Fortunately they for the most part die of the disease and not of hunger. The use of bougies, except for making an absolute diagnosis, is in such cases absolutely forbidden; they can only aggravate matters. Opening the stomach has been proposed, but for the reason above given, is useless; the patient dies of the disease, or from some of its complications caused by perforation or ulceration.

Other difficulties of swallowing may arise from dilatation and consequent impairment of muscular power in the

œsophagus. The dilatation may be due to the existence of stricture, sometimes to unknown causes, or to what are called diverticula. Some of these forms of disease promise well with electricity, but some are more intractable. To the former group belong certain nervous maladies, some simulating stricture, some paralysis. Both may be due to central nervous disease, but both may be the result of constitutional states of an hysterical nature, and should be treated with the remedies appropriate to the hysterical or badly balanced nervous condition.

DISEASES OF THE STOMACH.

ACUTE GASTRIC CATARRH.

Acute gastritis, except when set up by an irritant poison, is an exceedingly rare affection; but the minor degree of inflammatory action to which the term gastric catarrh is given, is excessively frequent. Any slight error in diet is in many persons sufficient to set up the malady, and when the supply of the digestive fluid is insufficient to convert the food into normal peptones, the fermentative changes it undergoes may give rise to irritating substances capable of producing this so-called gastric catarrh. Diminution of the secretion is common in all fevers, and in them gastric catarrh is frequently, if not invariably observed, especially if the diet has not been altered so as to suit the digestive powers. The same may be observed in other acute maladies. When the gastric juice is deficient from other causes, as natural debility, from imperfect growth in children, or as is habitually the case in old people, the same result follows; but perhaps irritant substances, especially alcohol, have more to answer for in giving rise to gastric catarrh than any others. If the food swallowed be not easy of digestion, some of its half-digested products may have the same effect; and even food easy of digestion, as milk, if introduced into a stomach where fermentation rather than digestion is going on, only adds fuel to the fire. Fatty substances are particularly injurious under such conditions, the fatty acids being separated and acting as powerful irritants.

However induced, acute gastric catarrh usually gives rise to certain definite symptoms, chiefly general depression, more or less fever, loss of appetite, nausea, and

sometimes vomiting; but pain, though sometimes present, is often entirely wanting. Normal digestion should be entirely imperceptible to the patient, but in gastric catarrh it becomes painfully sensible. He has uneasiness or actual pain at the epigastrium, with a feeling of distension, the head is hot and the feet cold, the pulse small, and the patient complains of great weakness or faintness, often he perspires freely a cold sweat. Soon the signs of imperfect changes in the food manifest themselves in belching of gas, sometimes odourless, sometimes fœtid. This may end in vomiting, and all may therewith end; but if not, the putrefying substances pass on into the intestines to irritate them in turn. This causes griping colicky pains, and irregularity of bowels, which are sometimes constipated, sometimes loose, both conditions being, however, best dealt with by a purgative. Frequently we find headache arising from gastric catarrh, sometimes of a very severe character; but this headache is not the true megrim or sick-headache, which is more strictly of a nervous character.

The cause of all this mischief is not difficult of detection. In the catarrhal condition of the stomach, the proper secretion of the peptic follicles is more or less arrested, whilst that of the simple or mucous follicles is greatly increased. This alteration in the quality of the fluid hinders instead of favouring digestion—hinders it whilst promoting fermentative change. Sugar and starch give rise to various acids, especially the acetic—beer or wine to acetic acid, milk to lactic acid, and fats to their several acids, setting free various gases in the process, and continuing the irritation which has produced the unusual flow of mucus. In infants whose sole food is milk, one can easily understand that such a condition would be one of some danger, and so it practically is, giving rise as it does to both vomiting and purging of greenish fluid, both being aggravated by the infant's ordinary food. With the catarrhal condition of the stomach it is common to find a somewhat similar state of the mouth, the tongue being thickly furred from over-growth of epithelium, with red papillæ projecting from its surface; there is deficient secretion of saliva and over-secretion of mucus—hence the mouth feels sticky and clammy; there is much thirst, partly at all events due to local causes, for it is more easily relieved by sucking some acid substance (as a piece of lemon) than by copious draughts of water. From changes in the epithelium in the mouth, the breath, if exhaled that way, is generally

foul smelling, whilst if exhaled by the nose nothing unusual may be detected about it. It is this form of gastric catarrh which gives rise to the so-called cholera infantum, the most prominent signs of which are those just alluded to. When in the adult the catarrh extends to the intestines, it constitutes the malady sometimes denominated cholera morbus.

Acute gastric catarrh seldom proves fatal to adults, however severe the attack may be for the time being; but in children it is different, and the malady, either directly or indirectly, in the form of diarrhœa, is in them a fearfully fatal one, even with the best of treatment. After death we do not always find reddening of the surface—if we do, it is, as a rule, punctiform; but often all blood is driven away by post-mortem contraction of the vessels. The gastric follicles are, however, changed; they are choked with large and granular cells, giving the mucous surface a punctated appearance, whilst the mucous membrane is thick and soft. The lenticular glands are large and filled with granular lymphoid bodies, sometimes breaking down and opening so as to form ulcerated cavities. Occasionally other and more superficial erosions are found, and rarely after death more complete softening takes place still, so that the walls of the stomach give way in removal. This, however, is mainly a post-mortem phenomenon due to the circumstance of a moderately high temperature and the presence of some fluid, digestive or putrefactive, which has the power of softening animal tissues.

Treatment.—As in most diseases of this kind rest is the most essential condition in the treatment of gastric catarrh, so that the irritated membrane and glands may have time to recover themselves. In accordance with this rule, in a goodly number of instances mere abstinence from food and, as far as possible, from drink—which is sometimes quite as irritating as food—will, with bodily rest, suffice for a cure. But when it is clear that imperfectly digested food is at the root of the mischief, it is better to get rid of it at once by an emetic, or if it has left the stomach, by a purgative. In this way recovery will be greatly hastened. As an emetic, lukewarm water will often suffice; but on the whole, it is better to use something more certain, such as ten grains of ipecacuan in powder with an equal quantity of sulphate of zinc. This, followed by copious draughts of warm water, will soon clear the stomach, after which rest is to be enjoined. If the irritant substances have passed on into the intestine a purgative should be given, and none is better than

half an ounce of castor-oil, with from one to ten drops of the liquid extract of opium according to the age of the patient. Even a fraction of a minim may be too much for a child under one year. In children a very valuable laxative is tincture of rhubarb, either by itself or with some aromatic spirit added to it; whilst in adults, the compound rhubarb powder is in some cases of equal utility. Some, however, prefer mercurials, especially calomel or blue-pill, but these cause in many people intolerable sickness and depression, worse than that of the gastric catarrh. To infants grey powder (hydrarg. c. cretâ), so often prescribed, had better not be given, or it may aggravate the condition. In short, in children an exact diagnosis of the cause of the vomiting and purging is of the first importance.

The stomach and bowels having been emptied, we must try to procure as far as possible rest for the affected organ. To that end, as already pointed out, but little food should be taken; and as the less the bodily exertion is, the less food is required, absolute rest in bed or on the sofa should be enjoined. Now of all remedies which tend to soothe the stomach, bismuth is commonly admitted by those who know how to use it to be the first. Ice is of great service, especially if chewed and swallowed while yet in the rough state; but bismuth can be continued for a longer time. In giving bismuth, however, we must never forget to give it in good large doses—not less than twenty or thirty grains—and it is best given made into a paste with some mucilage or with milk, and this should be repeated three or four times a day. If there is much pain, a small pill made of morphia and chalk, with mucilage of gum to form a mass—the whole freshly prepared—will do much good, but otherwise it is better avoided. When the flow of mucus is considerable and the acid fermentation of the food persistent, alkalies—especially liquor potassæ in ℥ 10–20 doses, magnesia in twenty to thirty-grain doses, and the sulphite or bisulphite of soda in doses of five to ten grains—will be found most serviceable. Hydrocyanic acid is by some recommended, but its value is doubtful, and in it we have no great faith. Carbonic acid is a very serviceable remedy, but not very easy to give without giving a bulk of fluid which may prove injurious, for in this condition of stomach bulk constitutes an irritant. However, small quantities of soda or sparkling seltzer-water are often of good service, whilst if we desire to combine a stimulant, a small quantity of good brandy may be added

to these, or better still, a small quantity of the driest champagne given.

This leads us to speak of the dietetic treatment of acute gastric catarrh. If very acute and the individual strong and healthy, no food need be given, and none ought to be given; but if it lasts for any length of time, or the patient be too debilitated to bear such a regimen, we must try to give the diet which is least hurtful. Of all these, the best is milk which has had the cream removed after standing for some hours, mixed with lime-water; the same with ice and bicarbonate of potass may be given, adding an amount of citric acid sufficient to cause effervescence, but not to neutralize the alkali. In all cases the quantity given at a time should be as small as possible. In many cases nothing suits so well as weak soups and broths; the stronger soups should be avoided, as should fats of all kinds. Starch in any form, too, and sugar are very apt to turn. Sometimes a small quantity of raw pulped meat sits better on the stomach than anything else, and this is a remedy of peculiar value in the case of children, who devour it greedily.

As the patient begins to recover, the irritability of his stomach passes away, but there is still a tendency to acid fermentation. Here it is that the diet should be carefully regulated; and here it is too that aids to digestion are of especial value, though of less than in the chronic form of the disorder. Good pepsine is very useful, but it must be good, or the patient is only deceived in its use; in this stage too it is often of great advantage to substitute acids for alkalies, together with some bitter tonic, as quassia, gentian, calumba, or cascarilla. Vegetables are, as a rule, to be avoided, and stale bread should alone be used. Stimulants if necessary are best given in the form of very dry sherry (a cheap and good manzanilla is easily procured now-a-days) or claret and water. Wine of full body should be avoided, and beer is to some little better than a poison. It is of all the greater importance to attend to diet, as there is in gastric catarrh a great tendency to relapse, and for the state to become chronic—one much more difficult of successful treatment.

CHRONIC GASTRIC CATARRH.

This malady is one much more commonly encountered than is generally supposed, and includes a very considerable number of those cases which were wont to be classed

as dyspepsia. Inasmuch as the symptoms are by no means decided, in many instances and during long periods its existence is apt to be overlooked except when from some fresh exciting cause there is a fresh outburst of the acute disorder. Chronic gastric catarrh may be sub-acute from the first, or it may result from repeated attacks of acute catarrh, or it may be connected with habitual congestion of the gastric mucous membrane from altogether different causes. The most frequent cause of chronic catarrh is habitually imperfect digestion, whether it is dependent on an insufficient supply of gastric juice, or on excess in quantity or error in quality of the food consumed, and it must be remembered that these are strictly relative, each individual being a law to himself and to none other. Next to this comes the habitual use of alcohol, especially in an undiluted form, and this acts not only as a direct irritant to the stomach itself, but also, secondarily, by setting up cirrhosis of the liver, and thus creating obstruction to the portal circulation. As a consequence of this obstruction the stomach becomes habitually hyperæmic, sometimes very greatly so. The same result may, however, arise from other causes of obstruction beyond the liver, as in emphysema and diseases of the heart; whilst for some reason, not altogether well defined, it is one of the most constant of the accompaniments of phthisis. In almost all of these chronic gastritis follows on repeated attacks of the acute form of the malady. Whenever we find cancer or ulcer of the stomach we usually find catarrhal inflammation in the neighbourhood; and we not unfrequently find it developed by the persistent use of such remedies as copaiba and cubebs, or even of such an apparently harmless substance as tea. In point of fact, the great majority of cases of dyspepsia seen among hospital out-patients are of the nature of chronic gastric catarrh, and the three great causes may be said to be bad and insufficient food, tea, and gin—very often all these acting together.

The signs of chronic catarrh of the stomach are by no means certain or invariable. They come and they go; and in one patient one sign will be much more prominent than in another. Pain is seldom a marked symptom; it may amount to a feeling of weight and oppression, sometimes, especially after a meal, more severe than at others. It may be considerably increased by flatulent distension, which is apt to occur after food, and from changes in the food itself. Acidity with heartburn is common. Nausea is

frequent, but vomiting is rare; in some forms of the disease, however, especially that which occurs in Bright's disease, this is a regular incident. So too in many cases dependent on chronic alcoholism, morning vomiting is a frequent symptom, the matters brought up being usually clear or mixed with bile. Appetite varies extremely, sometimes entirely lost, sometimes voracious; thirst too is far from constant, though commonly present. Very often it is a desire for something to clear the clammy mouth, rather than an actual sense of bodily want, and drinking in any quantity serves only to increase the discomfort. The tongue is usually furred and flabby, giving from the decomposing secretions of the mouth, and the increased flow of saliva which is apt to occur, a foul odour to the breath if exhaled by the mouth. But the tongue may be quite clean or redder than natural, for its indications are not constant. The catarrh of the stomach very often extends to the bowels, and gives rise to flatulent distension, colicky pains, and irregular action. Very often the stools are partly slimy on this account, and vary greatly in character—at one time hard, and at another time unusually loose. Sooner or later the general nutrition becomes impaired, and signs of this show themselves in emaciation, dry wrinkled skin and flabby muscles, whilst the gums shrink and become spongy. Mental depression is a very constant characteristic of this affection. The patient loses confidence in himself and his powers. Sleeplessness is very troublesome, and may exist in an extreme degree so as to become almost unbearable. The condition of the urine is peculiar, inasmuch as it tends to vary greatly—at one time excessively acid, and at another alkaline and depositing phosphates; at another oxalates may be thrown down in large quantity. The prime character in all cases is variability. We cannot expect to find all the above symptoms present in any one case at one time, or even at any time, but they may appear from time to time.

If from any cause death occurs, the mucous membrane will be found in various states as regards vascularity; but most frequently of a slate-grey colour from rupture of small vessels, effusion of blood, and alterations in its hæmoglobin. The vessels too are dilated and tortuous and the membrane thickened and hardened instead of softened, as in the acute form of the disease. A condition termed mammillated has been described as quite characteristic. It consists partly in folding of the membrane,

partly in unusual prominence of the glands. It is most frequently found near the pylorus. The glands themselves undergo changes unfitting them for actual secretion, such as granular and fatty changes in the secretory cells, which, in many instances, have entirely disappeared. Sometimes the gland tubes are obstructed, and the tubes turned into cysts. The other coats are also altered and thickened, sometimes œdematous, sometimes fatty.

Treatment promises much in chronic gastric catarrh. If the remains of an acute attack, or if an acute attack be superadded to the chronic condition, the remedies already referred to under this heading must be employed, bismuth being the most important. Dietetic rules are here of the greatest importance, but each man is a law to himself. These laws must, however, be strictly obeyed. No remedy seems to do so much good in promoting general nutrition as pepsine, whilst, for allaying irritability, liquor potassæ, bicarbonate of potass, and bismuth are the great remedies. The rule in giving these is this: let the patient have say ♏ 10 of liq. potassæ in a light bitter, such as calumba, half an hour before food. With his food let him have fifteen or twenty drops of dilute nitro-hydrochloric acid, say in tincture of cascarilla, with or without pepsine, and, as a rule, the patient will improve. Small quantities of meat may be given raw, or milk as buttermilk used in bad cases; but since the malady is chronic so the treatment must be gradual, and hence restricted diet does not give such good results as in the acute form. Two remedies have been highly belauded—nitrate of silver and arsenic. Of their value, however, we cannot speak with certainty. Of more undoubted value are certain mineral waters, especially those of an alkaline or saline character. Natural seltzer is a capital beverage; so too are the Vichy waters; but those most highly spoken of are the waters of Carlsbad and Marienbad—springs not very far apart. The warm—not hot—waters seem to answer best. The waters, whether drunk at Carlsbad or at home, should be taken early in the morning, fasting, followed an hour or so after by a light breakfast. The diet must be steadily regulated at the same time. Later in the disease, when iron becomes essential, we find its various forms best combined with strychnine, and the most unirritating preparation should be used. Ipecacuan too in good large doses seems to be of considerable service. The mineral

waters which contain iron in small quantity are also of great service, but which to prescribe is not exactly an easy task. In every case proper hygienic conditions must be attended to, for the condition of the stomach acts and reacts on that of the system generally, and perhaps especially on that of the skin.

ULCER OF THE STOMACH.

Ulceration of the stomach is a malady far from rare, as post-mortem results show, yet as far as symptoms go, by no means so common. The characters of the lesion are very distinctive. It consists of a round punched-out hole in the mucous membrane of the stomach, or it may be extending deeper, but beyond inflammatory thickening of its edges which sometimes occurs, there is no sign of any other change of texture. This leads us to the belief that gastric ulcer differs in its causation from most other kinds of loss of substance, and recent investigation has only tended to encourage this belief. It is now generally held that the so-called ulcers are due to plugging of the vessels of the mucous membrane over a certain area; and that consequently the portion of tissue supplied by these with alkaline blood is no longer protected from the action of the gastric juice; accordingly this promptly attacks it, dissolving it, and so exposing the tissues beneath over an area exactly corresponding to the plugging of the vessels. This plugging is for the most part of the nature of thrombosis, more rarely of embolism, and seems to be most frequent in chlorotic females, who are peculiarly liable to this form of disease. It is frequently found about puberty, and again in later life, when it is very often associated in the female with amenorrhœa. It is curious to note the frequency with which mental anxiety and gastric ulcer are associated, though it is difficult to understand how they are related to each other. The same kind of ulcer sometimes makes its appearance in the duodenum, especially, it is said, after burns. The size of the ulcer varies greatly—it may even amount to five or six inches, especially in cases of long standing, but the ordinary ulcers do not exceed an inch or an inch and a half in diameter. They are most frequently encountered on the posterior wall of the stomach towards its pyloric end, and though near the curvatures are seldom situated on them. The number of ulcerations varies; most frequently there is only one, sometimes two

or more, but ulcers and cicatrices are frequently found conjoined. The appearance of the ulcer varies according to its stage; if quite recent it is funnel-shaped, the coats being less and less affected outwards, the sloping edges are smooth and even, but the base of the ulcer or apex of the funnel may have a sloughy appearance; later on this changes, the edges undergo what might be called inflammatory changes, and cicatricial tissue is formed. Gradually contraction takes place, leaving a mark on the mucous membrane only, if that alone has been perforated, or in the peritoneum also (from contraction) if the muscular coat has been pierced. If the ulcer has been large, the contracting cicatrices may give rise to stricture. This is the most frequent history, but sometimes no cicatrization follows; the ulcer burrows deeper and deeper until the peritoneum is reached. This sloughs and gives way, and the contents of the stomach escape, setting up fatal peritonitis. But other consequences may flow from the gradual ulceration; as it proceeds towards the peritoneal surface inflammation of that membrane is set up, and if any organ be adjacent to the point where perforation threatens, its serous covering may unite with that of the stomach, so that when the whole of the coats have been penetrated the opposed organs prevent extravasation of the contents of the stomach, and so death is for the time averted. This most frequently happens when the ulcer is situated on the back wall of the stomach, and near the pylorus. The pancreas and left lobe of the liver, the spleen and the omentum are the organs most frequently opposed to the ulceration. The ulceration or softening process sometimes extends into these and softens them, but most frequently they succeed in opposing it, their connective tissue proliferates, and a floor of contracting cicatricial tissue is formed by their surface, which, if the ulcer be not too large, may lead to its cure, leaving behind the two organs permanently united by a formidable cicatrix. Other adhesions than those already mentioned may occur, but they are curious rather than useful. Another result of this ulceration is hæmorrhage; slight hæmorrhage from the destruction of small vessels before they are completely plugged is common enough, but sometimes a larger vessel is divided, and then most serious hæmorrhage follows, and this constitutes one of the great dangers of gastric ulcer. It seems at first sight difficult to understand why hæmorrhage does not more frequently follow, but the action of the gastric juice tends to coagulate

the blood and so to plug the vessels, and the tissues of the vessels themselves are naturally strongly resistant, so that they may be found entire after the surrounding tissues have been eaten away. The arteries perforated are usually the coronary, the pyloric, the left gastro-epiploic, the gastro-duodenal, and if towards the great cul-de-sac the splenic or some of its branches, especially those going to the pancreas. The pancreatic branches are especially liable to erosion, if perforation of the substance of the organ takes place—a distinction which is worth bearing in mind.

Now the symptoms of gastric ulcer may be of the slightest or of the severest kind. There may be no sign of anything beyond a slight degree of indigestion till ulceration takes place, and the patient suddenly perishes either from hæmatemesis, by perforation of an unplugged blood-vessel, or of peritonitis from escape of the contents of the stomach into the peritoneum. But these cases are the exception. Most cases have a chronic course, in which pain, vomiting, hæmorrhage, and impaired digestion are prominent symptoms. Pain in greater or less degree is present in most cases, and in a considerable proportion of them there is also tenderness. The pain in some cases is constant, in some paroxysmal: if constant it is usually of a burning or boring character, and can be distinctly relegated to one particular spot in the epigastrium or in the back, low down between the scapulæ. The paroxysmal form, though also referred to the epigastrium, is more generally diffused, and whereas the former is frequently least when the stomach is empty, this, which partakes of the nature of a semi-indigestion, is always worst shortly after a meal, and is generally relieved by vomiting. Both kinds of pain may intermit completely and again recur. Tenderness is sometimes a very prominent symptom, in others it does not exist. Where very great we have probably to deal with a slight degree of peritonitis. When due to the ulceration it generally exists over a very limited area. Vomiting is one of the most troublesome symptoms of gastric ulcer, inasmuch as it seriously interferes with the patient's nutrition and so with the general strength. It is not invariable, but when it does occur we most frequently find it coming on soon after food—the sooner the nearer the ulcer is to the cardia, and the more irritating the food or drink swallowed. Hot things seem to provoke pain and vomiting to an unusual extent. The matters vomited vary in their characters according to the capacity for digestion and the time elapsed after the meal before its

ejection. Most frequently some amount of gastric catarrh coexists with ulceration, and so we have mucus added to the food swallowed, causing this to undergo fermentation, so that the vomited matters are sour and foul smelling, or the vomited materials may consist of nearly clear fluid. In many cases where retention of the food in the stomach has taken place, small dice-looking bodies called sarcinæ are occasionally detected in the vomited matters. A not unfrequent constituent of the vomit is blood in greater or less quantity; if in small quantity then dark and grumous in character, giving the strings of vomited mucus a dirty, earthy, black appearance. If poured out in larger quantity and the blood at once vomited by itself, it is of the usual bright red colour, but if retained for even a short time it is blackened by the gastric juice. Blood may, however, be poured out in such quantity when a large vessel is perforated that the patient may die without vomiting at all, and in almost every case more blood is poured into the stomach than is vomited, some of it passing on into the bowels, giving a black, tarry appearance, and a peculiar indescribable odour to the stools. This is sometimes called *melæna*, and it may be the only outward sign of gastric ulcer. The indigestion which usually accompanies gastric ulcer is of the usual type of gastric catarrh of the chronic form: there is pain, flatulent distension, heartburn, and a general feeling of oppression, but the vomiting has worse effects than the indigestion; from the two combined the patient wastes to a shadow, becomes painfully nervous and fanciful, and weak to the last degree. With all this his appetite may be fairly good, but his nutrition is bad, and so the general health suffers. This is not, however, the case in all, for we sometimes find gastric ulcers in rosy-cheeked females. As a rule the bowels are confined, but sometimes, especially when there is melæna, the patient is troubled with looseness.

Though gastric ulcer is commonly seen in young people, there is a characteristic chronic form sometimes encountered among those advanced in life. The tendency of the disease is to recovery, but that may be very gradual; we are not, however, to despair even in the worst cases of hæmatemesis. It is within the experience of every physician that the most unlikely cases, under proper management, may come round. Peritonitis and exhaustion are more to be dreaded.

Treatment.—The treatment of gastric ulcer is at once medicinal and dietetic. The great thing is to procure

rest. And here we must again insist upon the fact, that very little food suffices to keep up the functions of life when the patient lies quiet in bed, and no food is required for warmth. Again, too, we must insist on the fact, that distension is one of, if not the prime, irritant of a gastric ulcer. Accordingly, only very little food should be given, and that only in small quantities at a time. Heat, as has been shown, also acts as an irritant; hence everything should be given cold—if possible, iced. Although on theoretical grounds we ought to avoid albuminous substances as articles of food, still experience points to a different conclusion, and we may safely order even the strongest. Milk is perhaps the best of all nutriments; it should be given iced, and with small lumps of ice in it, or even frozen. It is better to have had the milk boiled, as it does not then coagulate; and in many cases a little corn-flour, arrowroot, or biscuit-powder added to it is relished by the patient. Even this may be too bulky, and we have seen patients do better on solid mock-turtle soup (the flesh being left out) than on anything, as a very small quantity of this suffices. But even this it may not be advisable to give, and then we must have recourse to nutrient enemata. As, however, the bowels are apt to be clogged by altered blood, it is always well to begin with a lavement of soap and water, waiting till the rectum has quieted before the nutrient enema is used. Let it too be remembered, that whereas the lavement should not be less than a pint, the nutrient enema should not exceed an ounce or two. The proposition to employ very fine chopped pancreas as the basis of the enema is well worth bearing in mind, since the albuminous substances must undergo some kind of digestion in the rectum, and it can hardly be of other than of the pancreatic kind. Sooner or later the patients get tired of milk and refuse to take it, so we must return to other food. Raw grated or pulped meat is sometimes very grateful, and whenever we begin with meat it should be given in a more or less pulpy state. Bread should be stale, or eaten as biscuit; vegetables should be avoided. The drink should be milk and water—better still, lime water; and if any stimulant is required, dry sherry or very weak brandy-and-water may be given. In the acute stage of the disorder, when stimulants are absolutely necessary, the best is very dry champagne, well iced and in small quantity. In gastric ulcer the use of medicine is twofold: we have to arrest violent and dangerous

symptoms, and we have to try to cure the ulcer. Foremost among all remedies is morphia, and it should be given in one or other of two ways—either subcutaneously (dose ½ gr. repeated as necessary), or if there be much local pain, the cuticle should be raised over a small patch by liquor vesicatorius covered over by a hot compress or poultice, and when the cuticle has been removed, half a grain of morphia mixed with a little chalk or starch should be dusted over it. For localized pain this is the best remedy. But again, the patient may be dying from loss of blood; here our resources may be heavily taxed, but the foundation of our treatment we hold to be ice within and ice without, ice to chew, and ice-bags to the pit of the stomach. Along with this we have seen the best results from gallic acid, made into a paste with dilute sulphuric acid and water, given so that each dose shall contain twenty grains of the one and twenty minims of the other. Acetate of lead, with or without opium, turpentine, and iron, have all been strongly recommended, yet all sometimes fail. If perforation threatens, opium, or rather morphia, is still our sheet anchor, and it should be pushed to the verge of narcotism; food must be given by enemata only.

For the cure of the ulcer all are agreed that after opium we must mainly rely on alkaline substances and bismuth, the latter given as usual in large doses. Abroad, the Carlsbad waters are most highly spoken of; if taken at home, they should be warmed to the temperature of the body, and should always be taken on an empty stomach. Some speak strongly on behalf of nitrate of silver, but it is certain that its use is not greatly in favour with the majority of physicians. Later on, iron should be given, either as a natural water or as reduced iron—one of its best forms. The phosphate of iron, the mistura ferri co. and the citrate of iron and quinine are also valuable forms of the remedy. The bowels should be carefully attended to, and that is best done by a purgative such as aloes, which does not act until it has passed through the stomach or by enemata. A small pill of the aqueous extract of aloes and extract of nux vomica, will be found most serviceable. A long rest is generally absolutely necessary before the patient returns to work.

CANCER OF THE STOMACH.

Of all internal organs the stomach is that most frequently affected with primary cancer, and the form

assumed is most frequently scirrhus. The part affected is generally the pylorus, and from this the malady tends to extend backwards by radiating lines into the stomach, being generally separated from the duodenum by a well-defined boundary line. Occasionally other parts of the stomach may be affected, particularly the cardia, when, unlike the pylorus, the cancer usually invades the œsophagus for some distance, though the greater and lesser curvatures may also be affected. It is not uncommon to find the scirrhous affection of the pylorus spread as medullary cancer towards the porta by means of the lymphatic system and the liver itself is often secondarily affected. Scirrhus originates in the submucous tissue either in the form of nodules or of a diffused hardness. The mucous membrane becomes affected and sloughs, leaving a blackened, dirty-looking surface, whilst the muscular coat hypertrophies; the peritoneum externally usually inflames and may become adherent, and so by these adhesions the cancer may spread to adjacent organs. As in scirrhus elsewhere, the fibrous predominates over the cellular element, and this gives the disease a contractile tendency which, as it commonly affects the pylorus and cardia, causes obstruction there, and so gives rise to some of the most prominent features of the disease. Again, we may find hard cancer forming a dense ring at the pylorus and the margins of the ulcerations in the body of the stomach dotted with masses of soft cancer. If medullary cancer first appears it tends to spread more rapidly than scirrhus along the mucous membrane, whence protrude fungating masses of cauliflower appearance which are apt to bleed. These masses may assume a villous character. The form of cancer called colloid is most frequently found in the stomach, but even there it is rare; it is a diffuse not a nodular change, ultimately involving all the coats, which show the characteristic gelatinous structure, and which, though ulcerating on the surface, never does so to any depth. As a consequence of the extension of cancer to other organs, softening, too, may extend to them, and so unnatural communications between the cavity of the stomach and adjacent hollow organs be formed, or it may even open externally.

Cancer of the stomach, especially of the scirrhous variety, is almost invariably a malady of more than middle age, as is indeed the case with cancers of other organs, and this is a material element in the diagnosis, since chronic

ulcer, with which it is most apt to be confounded, usually occurs earlier in life. And this is the more important, since cancer of the stomach is by no means easy of recognition in all cases, and sometimes is only found out on the post-mortem table. The symptoms may be said to be of three kinds: those due to the accompanying dyspepsia, those due to the cancerous element, and those due to the existence of a cancerous mass. There are few cases in which symptoms of indigestion do not present themselves. There is loss of appetite, a feeling of fulness and oppression after food, flatulence, loss of strength, and progressive emaciation, all without any definable cause; the tongue is clean, and the individual, who has probably been in good health up to the commencement of this particular illness, can give no reason for its accession. By-and-by pain comes on in most cases, and though it may in some seem to be entirely due to fermentative changes in the food, it may present peculiar characters, at first dull and heavy, afterwards darting and shooting or burning and tearing. The attacks of pain, particularly of the first class, tend to be intermittent, and may sometimes be long absent, but sometimes there is also pain of a remarkably persistent character. As to site it may be localized, but most frequently is diffused over the epigastrium or between the shoulder blades. After pain, vomiting is the most constant symptom, and it affords some important characteristics. Thus, if the cardia is affected, no sooner is the food down than it is up again, except (as not unfrequently happens) there is dilatation of the œsophagus above the stricture. If at the pylorus, it is not returned for an hour or two; if in some intermediate situation, rejection occurs at irregular intervals, or not at all. The matters ejected vary in appearance. Sometimes (as in stricture of the cardia) the food is little altered; if at the pylorus, the food is usually half-digested or fermented, sour- or foul-smelling, and having a copious addition of fluid, gastric or mucous. In a good many instances, especially in medullary cancer, blood is effused, and being acted upon by the gastric juice, is ejected as a dark grumous mass—"coffee-ground vomit." Extensive hæmorrhage is not common in cancer; it inclines the diagnosis to simple ulcer. The altered food, too, has generally a frothy kind of scum on it, and in it may be found in most cases ferment fungi—torulæ and sarcinæ. From the mal-digestion, as well as from the malignant cha-

racter of the disease, emaciation and loss of strength come rapidly and surely; at the same time the patient acquires the dirty yellow, sallow colour which is so characteristic of the disease. This often appears early in the history, and may give us a valuable clue to its real nature, but it may be absent till late in the disease; whilst if the porta be affected, we may often have jaundice conjoined with it, from obstruction to the bile ducts. From the general weakness we usually find in the later stages, when debility has become excessive, some œdema of the legs—sometimes, when due to weak circulation, in both—sometimes, especially if due to thrombosis, in one only. The most characteristic signs of cancer of the stomach, however, are derivable from increase in size; this is peculiarly true of cancer of the pylorus. Unfortunately tumour is by no means invariably present, and though present it may not be in the epigastrium, but lower down, dragging down the stomach by its weight. Thus we may find the tumour as low or lower than the navel. The swelling will generally incline to the left side, but if very large may cross the median line. The mass is usually hard and irregular, and changes its position with the condition of the stomach, but in others it is absolutely fixed. This tumour, if pyloric, is usually resonant on percussion—an important mark. The tumour too is usually tender on pressure, sometimes highly so. If at the cardia, no tumour will be perceptible, but if at the pylorus, we generally have something else to guide us—viz., distension of the stomach. As owing to stricture of the pylorus the food cannot pass along, it undergoes fermentation, and so the stomach is distended and habitual distension ends in dilatation. In this condition the shape of the stomach can sometimes be easily made out, and its motions felt; but in others there is only a diffused tympanites over a certain area. The distended stomach may in some cases come to occupy the greater part of the abdomen, and may push the diaphragm high up into the chest, to the great discomfort of the patient. In other cases, especially where the substance of the stomach itself is the site of the cancer, there may be notable shrinking and thickening of the viscus. In such cases we have the reverse of these symptoms—no signs of a stomach where one should be, a sunken belly, and a pulsating aorta. Constipation is always a troublesome symptom in cancer of the stomach; but as little passes through the pylorus, so little requires

to be passed by the bowels, except indeed there be melæna.

Treatment.—This is hopeless, yet much may be done for the relief of the sufferer. If he suffers from fermentation of food, we can regulate his diet and give him creasote or sulphurous acid; if there is much pain, we can relieve it by opium, or better, by morphia under the skin or on the raw surface. If there is great accumulation of flatus or fluid in the stomach, we can draw it off by the stomach-pump, and wash the stomach out to the patient's great relief and comfort. The constipation we can relieve by enemata. But all this is merely palliative. Emaciation goes on, the patient becomes weaker and weaker, and will finally sink from exhaustion, if not carried off by an intercurrent peritonitis or hæmorrhage. Such being the case, and ulcer having a totally different tendency, a correct diagnosis is of the first importance. Unfortunately, it is not equally easy; age and the existence of a tumour are perhaps the best guides.

HÆMORRHAGE FROM THE STOMACH.

This has already been incidentally discussed under the head of ulcer of the stomach; but there are other and perhaps more frequent causes of extravasation of blood. We have alluded to the slate-coloured appearance of the stomach in chronic catarrh, as indicative of small bleedings into the tissues of the organ and their subsequent changes. In females whose menstrual flow is obstructed, we sometimes find vomiting of blood, apparently vicarious, coming on at their usual monthly periods, but portal obstruction is a much more serious cause of gastric hæmorrhage. Most frequently this is owing to cirrhosis of the liver, but it may also be due to other lesions, as plugging of the portal vein, or by other changes in the liver causing obstruction. Disease of the lungs and heart, though the cause of gastric congestion, seldom gives rise to hæmorrhage. Again, in some diseases, the vomiting of more or less altered blood is a constant phenomenon. This is especially true of yellow fever, and some other maladies of the system, as those of a scorbutic kind. It may also occur as an indication of the hæmorrhagic diathesis. In these various forms of hæmorrhage, even supposing that death ensues from them, we most frequently fail to discover its source; there may be some

superficial infiltration of blood which tends to softening and erosion, but these exist quite independently of any hæmatemesis. Of course if large vessels have been opened by cancer or ulcer, we may hope to find the orifices. Vomiting of blood is not by itself a certain sign of gastric hæmorrhage, for in hæmoptysis, if at all copious, the blood comes up by gulps, not unlike the action of vomiting, and generally some is swallowed; but if in any quantity we can seldom long remain in doubt. Usually before vomiting begins there are signs of loss of blood, yawning, sighing respiration, pallor, depression, heaviness at stomach, with faintness and dizziness. A warm, sweetish fluid rises in the throat, and then with a sudden outburst comes the blood, very often in large quantity; if altered in dark masses, but sometimes, if freshly extravasated, bright red. The patient becomes unable to move; even trying to sit upright causes fainting; the lips are pallid, the breath cool, and he lies utterly prostrate. From this condition he usually recovers, for comparatively few die from the vomiting of blood. It is more dangerous when there is no vomiting: the patient then dies at once. The blood gradually ceases to flow, the melæna disappears, and by slow degrees convalescence returns. Often if much blood has been lost, the patient becomes hydræmic, and somewhat dropsical, but this clears away with increasing strength, and the patient recovers more or less permanently.

Treatment.—We have already alluded to the principles of treatment under the head of ulcer of the stomach. Here we must deal with the other varieties of hæmorrhage. If the bleeding be due to amenorrhœa, we must try to bring on the menstrual flow rather than direct attention to the vomiting of blood. If dependent on altered conditions of the blood and blood-vessels, as in yellow fever and scurvy, the general state of the system demands more serious attention than any particular symptom. When due to obstruction in the liver, it is very important to take advantage of the evident signs of this, for as a rule the first bleedings are slight, and only indicated by melæna. In such cases, saline purgatives in small doses, as sulphate of magnesia or soda, with or without sulphuric acid and sulphate of iron, are the best remedies. Ice too is invaluable; and as a stimulant, the use of which, by the way, demands the most urgent care, iced champagne or pale brandy and soda-water is best, but always in exceedingly small quantity.

ATONIC DYSPEPSIA, OR INDIGESTION.

Among the disorders which used to be called "essential"—that is, which depend on no very manifest structural lesion, dyspepsia held a prominent place. Since the introduction of the microscope, many of these maladies without lesion have been proved to depend on textural changes, not gross enough for detection by the naked eye, but readily detected when aided by magnifying power. Many of the cases which were classed as pure indigestion are now known to depend on important structural changes, as gastric catarrh, or even ulcer and cancer, which may have no other symptoms than impaired digestive power. Still, a group of cases come under our notice where there are neither the signs of catarrh, nor of any structural lesion of importance beyond thinning of the mucous membrane and sometimes degeneration of its glands, in which digestion is greatly impaired, and which we are still compelled to classify as dyspepsia or indigestion. These in all probability mainly depend on variation in the quantity and quality of the gastric juice, certain changes in which occur as a matter of course under various conditions. Thus in the aged both the gastric juice and the nervous power of the stomach tend to fail, and in this way arises one of the chief causes of their failing nutrition. Hence it is that they suffer under imperfect rather than mal-digestion. In certain states of the system, particularly in pyrexia, the flow of gastric juice is almost completely suspended. Thus it is in fevers, whilst in other states its composition is seriously modified, as when mixed with urea in uræmia, or when watery, as in chlorosis and anæmia. Again, the nervous system has a very powerful influence over the secretion of gastric juice, as we see in the influence of fright and anxiety, in completely suspending it, but many other causes act in a minor degree in the same fashion.

In atonic dyspepsia, digestion is always a slow process; hence the symptoms which it gives rise to are protracted, sometimes extending from one meal to another, and consisting for the most part of weight and uneasiness, seldom amounting to pain. But there may be neuralgic pains in certain cases, or the flatulence, which is always a prominent symptom, may give rise to symptoms amounting to pain. This flatulency depends mainly on the fermentative changes which go on in the imperfectly digested food, and to which are due the presence of the butyric and acetic

acids which are sometimes belched up, or rise up into the throat. From the presence of the gases so developed, the stomach is usually bulging during digestion, but pressure on it instead of giving pain usually gives relief. Sometimes, but not always, the flatulent distension extends to the bowels. This flatulent condition almost always gives rise to mental disturbance and depression, sometimes of a serious kind. It also frequently interferes directly or indirectly with the breathing and with the heart's action, confirming the patient in the belief that something very serious is the matter with him. One of the most troublesome symptoms when it occurs is dizziness, very often coming on as the first sign of an attack of flatulence, and very distressing to the patient. In many respects, therefore, the malady resembles in its symptoms chronic gastric catarrh, but the appetite is usually smaller, there is no thirst, and we have something of a guide to the differential diagnosis in the state of the mouth. In gastric catarrh this almost invariably suffers along with the stomach, so that the tongue is furred and the breath foul; but in dyspepsia the tongue is most frequently clean if flabby, and the inside of the lips and cheeks are pale and anæmic, and the tonsils enlarged. So, too, as regards the effects of indigestion: hot, irritating substances, as spices and pickles, are very badly borne in catarrh, whereas causing as they do a temporary increase in the flow of gastric juice, this gives relief in atonic dyspepsia. In atonic dyspepsia we have everywhere the muscular system in a flabby condition, the muscular coat of the intestines sharing in the debility, hence we generally have constipation as one of the marked signs of this malady; but as the fermentative changes in the food continue, flatulent distension with pain and rumbling are frequent. Moreover as the patient is too often fond of doctoring himself with strong purgatives, this increases the mischief, as the bowel ceases to respond to ordinary stimuli. In all cases the pulse is slow and weak, easily raised by the slightest exertion; the skin is cold and clammy, sometimes perspiring freely a cold perspiration, at others retaining the cold clammy character even after exertion.

The *treatment* of atonic dyspepsia is both easy and difficult: easy because the indications are plain enough, but difficult to carry out. The patient must for a time be strictly dieted. The food must be good but plain; meat well but not overdone should be eaten in moderation, along

with stale bread and enough vegetables to give it a flavour. What vegetables are to be used can hardly be beforehand stated. Fat meat, pork, veal, and salted meats are to be avoided. Boiling, broiling, and roasting are the means of cooking to be employed. Frying and baking render meat less digestible. Stimulants should always be allowed, sometimes in considerable quantity. The best is dry sherry, or good sound claret, though some of the white wines of Burgundy, Hungary, and Bordeaux are excellent for giving an appetite and helping digestion. Change of air and scene are always important elements in the cure. A dry, bracing climate should be selected, hot and moist situations strenuously avoided; but mere change by itself often does good. Walking exercise is best, but in no case should the exercise be allowed to lead to exhaustion. A walking tour is a good plan of obtaining all these things; then all but personal luggage should be sent on by train, and the journey divided into a forenoon and afternoon portion, with a good meal between. In such cases a cheerful companion is of great value, for the patient tends to mope and to eschew society except he be drawn out of himself. Cold bathing, especially sea bathing, is strongly to be commended; but in any case we must remember that the bath is to be taken for the purpose of procuring a reaction, and so the patient should only remain long enough in the water to procure that, and the reaction should further be aided by a good rubbing down with a rough towel, and a smart walk taken promptly after the bath.

The medicinal remedies to be employed vary in different cases, but in all bitters form an important ingredient. Sometimes a simple bitter suits best, especially if there is any tendency to the irritative or catarrhal form of dyspepsia, or in that case we may do well to add to it a small quantity of alkali, especially the liquor potassæ; but in most cases an aromatic bitter like cascarilla, or a simple bitter like calumba, quassia, or gentian—to which an aromatic has been added—is better. In the majority of cases, however, strychnine or its raw basis nux vomica, which combines a certain influence on the nervous system with its tonic action, is the remedy above all others. In most cases these bitters may be combined with a little acid, and given either before or during food. Such a combination as liq. strychniæ ♏ x, acidi nitro-hydrochlorici diluti ♏ x, in infusi calumbæ ʒss; for a dose, is a very good one,

and agrees with most patients. To this, if the anæmia be great, iron should be added from the first, but the form in which to give it is not always easily made out, for some are too irritating, especially the perchloride. A very good plan then is to give along with the mixture just alluded to, or something similar, either an insoluble preparation of iron (as the reduced iron) along with food, or to administer the iron in the form of pill; for this purpose the carbonate, the sulphate, or the phosphate may be employed, and may be well combined with watery extract of aloes, or with rhubarb as a stomachic and purgative. Strychnine should not be given as a pill for fear of unequal distribution; extract of nux vomica should take its place. Pepsine along with the food is often of great service, but no one single remedy should be continued for too long a time together.

NERVOUS DYSPEPSIA.

The functions of the stomach next perhaps to those of the heart seem to be more directly under the influence of the nervous system than those of any other organ in the body. We have already seen that anxiety and fright as well as other mental emotions may completely arrest its functions, but besides this we may have pain, vomiting, and perversion of function from apparently purely nervous causes. Pain is in most instances a prominent symptom, and may constitute the only sign of the nervous derangement; in short, we may have a pure neuralgia of the stomach as of any other organ, but as of other organs, what begins as, or seems functional, usually ends in actual lesion. What is called nervous dyspepsia is most common in females, in whom the emotional nature is more highly developed than in man, and it is especially liable to make its appearance when these emotions have been allowed to induce exhaustion. In females this form of indigestion if it becomes at all chronic is almost invariably associated with hysteria, and very often we may find something also wrong with the uterus, ovaries, or sexual functions.

In nervous dyspepsia there is not so much loss of appetite as irregularity or capriciousness; at one time the patient will eat voraciously, at another cannot be induced to touch a morsel; sometimes there is perversion of appetite, the patient desiring all kinds of out-of-the-way

things, sometimes even dirt or the like. In a good many instances the pain which accompanies this malady is relieved by food, particularly if of a very sapid character: hence the relish for salted and spiced meats, and the distaste for articles of food which, though nutritious and digestible are insipid. But there are others where food of any kind gives rise to pain. We should, however, point out that, besides these attacks, which we must call nervous dyspepsia, we have others of a purely paroxysmal and neuralgic character. Such attacks are sometimes described as *cardialgia*, in contra-distinction to the pain which results from improper digestion called *gastrodynia*. The pain comes on suddenly and is excessively severe, extending from the epigastrium to the back, and it is relieved by pressure. The patient feels faint; the countenance is shrunken, the pulse small, the hands and feet cold—in short, is collapsed, whilst the bowels are either retracted or distended. Gradually the pain abates, very often passing off with eructation or with vomiting, and the patient remains comparatively well, with little indication of dyspepsia other than of the atonic kind till the next attack. Vomiting is common in both varieties, especially so in those complicated with hysteria, and is preceded by little or no nausea, what there is lasting only a short time, and the appetite being often good throughout the complaint. In fact, the vomiting and eating may alternate. Nevertheless we generally find the subjects imperfectly nourished.

Treatment.—Foremost when the relief of pain is required comes morphia, given in the form of drops or pill, from a quarter to half a grain of the hydrochlorate being administered at a time; but it must not be lightly repeated, for such patients are only too apt to snatch at anything which yields them comfort, and to continue it long after it has ceased to be necessary. The same remark applies with equal force to stimulants. When more purely neuralgic, iron as carbonate (mist. ferri co.) should promptly be given with or without bismuth. A very useful combination is liq. ferri perchloridi with the chloride of ammonium. When the malady is evidently neuralgic some speak very highly of the so-called antispasmodics, valerian, zinc, and the like; but they are of less value than such remedies as belladonna internally and externally, with or without strychnine; as to the effects of these we have some actual knowledge.

DISEASES OF THE INTESTINAL CANAL.

CATARRHAL ENTERITIS.

Enteritis, or inflammation of the alimentary canal from the stomach downwards to the rectum, particularly of the catarrhal variety, is a very frequent malady; the ulcerative form is much more rare. *Intestinal catarrh*, like other forms of catarrhal inflammation, is the result of hyperæmia, whether venous or arterial, if at all persistent. To this class of causes belongs the portal congestion dependent on obstruction in the liver—that depending on heart and lung disease being more rarely followed by catarrh. The most common form of catarrh, however, is that dependent on direct irritation, as from some varieties of purgatives, especially those called drastic and hydragogue. To the same class of causes belong all irritating substances swallowed and not altered in the stomach, and which passing on into the intestine, set up a certain degree of inflammation. Most indigestible substances act this way, as do also those substances which (though digestible enough) have not been digested in the stomach, and which, having first given rise to gastric catarrh, pass on to fulfil the same end in the intestine. There are still other causes, more or less doubtful, including the effects of cold, the implication of the mucous membrane in inflammation of the serous coat of the intestines, or when enteritis occurs as complicating other disorders.

However produced, catarrh of the intestine generally begins in one portion of the intestine, thence extending upwards or downwards, rarely affecting the whole length of the tube. The great intestine is most frequently the site of catarrh; if that alone be affected, we have only slight dysenteric symptoms. The small intestine is not so often affected, the ileum being most frequently so, the liability decreasing in order upwards. As in catarrh of other mucous membranes, there may be little or no indication of the disorder, after death, the mucous membrane being sometimes perfectly pale, but in other cases it is red, swollen, and pulpy, and easily removed from œdema of the submucous tissue. In some cases the whole circumference is affected, but more frequently it is limited to smaller areas surrounding the solitary and Peyerian glands, which are enlarged and project above

the surface. The mesenteric glands, too, are commonly swollen from proliferation of their elements. If the catarrh has been chronic, the membrane and perhaps the coats below it are thickened, the colour is brown or grey from altered blood derived from ruptured capillaries, whilst certain parts project like villi, giving it a flocculent or villous appearance. In catarrh we have always increased secretion, in the first instance thin and watery, containing comparatively few cells, later a tough and semi-puriform mucus.

As a consequence of the intestinal catarrh and the free effusion of fluid, we have almost invariably in the first instance thin fluid stools, whilst from the same cause and the irritation we have the bowels moved more frequently than usual. This diarrhœa may be the only sign of intestinal catarrh. At first the stools are feculent and have the usual odour, but are thin and watery; but if the catarrh continue after all the fæces have been evacuated, then the stools lose their feculent odour and consist mainly of serous fluid, with the contents of the intestinal epithelial cells, and more or less altered food. Early in the malady the bile is poured out from the intestines not so much altered as usual; hence the stools have a greenish shade, varying in intensity according to the copiousness of the stools, being least marked where they are most abundant. But if the duodenum be affected, the catarrh extends to the bile-ducts, stops them up by swelling of the epithelium, and so arrests the flow of bile, and gives rise to jaundice. The fluid secreted by the bowel under irritation contains little or no albumen, but much chloride of sodium and usually crystals of the triple phosphate. Next after diarrhœa, pain is the most frequent symptom, varying however, in intensity. The pains are mainly griping or colicky, coming on in fits; but sometimes we also have a kind of aching pain, or a feeling of soreness in the abdomen, when these have passed away. Tenderness on pressure (save in the perforating ulcer of the duodenum) is rare. With the catarrh we have some fever and a feeling of chilliness, but these are never very marked. The abdomen is in most instances somewhat swollen, being distended by the putrescent gases dependent on imperfect digestion; but in other cases it presents nothing abnormal. The inflammation may in such case be limited to the small intestine, and so no diarrhœa follow, the fluid effused being reabsorbed in the great intestine.

Chronic intestinal catarrh may occur in children as well as adults, but in the former it is a much more serious affection. In the adult this condition is more frequently accompanied by constipation than by diarrhœa; the mucous membrane is thickened and covered with a tough tenacious mucus; the muscular coat too may be impaired in efficiency; hence follows imperfect absorption, sure fermentative or putrefactive change, and imperfect peristaltic motion. These in their turn give rise to emaciation, and impaired nutrition generally, as well as to flatulent distension of the bowels, with all its accompanying discomforts, and constipation. When the bowels are opened, there is a free discharge of foul-smelling flatus, and the fæces are covered with mucus, and have a putrescent rather than a natural fæcal odour. Such patients are unusually prone to mental depression and are constantly seeking after remedies for their various ailments, real or supposed. Much more rarely in adults we find diarrhœa, for persistent diarrhœa generally indicates something more than mere catarrh. In such cases mucus forms the main ingredient in the motions, but half-digested food or soft fæces may also be found. If hardened masses of fæces be found along with the mucus, we have reason to assign the great gut as the site of the mischief. In children, however, diarrhœa is nearly always the mode in which chronic catarrh shows itself, and this constitutes one of the most fatal of infantile ailments. It is most frequent in infants who are brought up by hand, or who have just exchanged their mother's milk for some less easily digested food. The motions are then loose, greenish in colour, and contain an unusual quantity of mucus; later the green colour disappears as the discharge of bile ceases, the stools become clay-coloured, and have a putrid smell; often they contain masses of undigested food, particularly milk curd. The child rapidly wastes, it becomes thin and looks old and wrinkled, aphthæ form in the mouth to exacerbate all the symptoms, and death ere long follows.

Treatment.—The treatment of *intestinal catarrh* is not so satisfactory as when the same mischief affects the stomach, for it is not easy so to administer remedies as to reach this part when they are designed to affect it specially. However, we may lay it down as a broad rule, that when the small intestine is affected we must trust to remedies given by the mouth; but if the great gut be affected, we had better try to reach it by the rectum. Again, as

a rule we should say that medicines intended to affect the intestines are better given as pill than in draught or mixture, being more likely to pass through the stomach undissolved. Very often slight degrees of intestinal catarrh, especially if due to irritant substances passing on from the stomach, are best treated by a purgative. The best remedy in such case is half an ounce of castor-oil with ten minims of liquid extract of opium; the castor-oil clears the bowels, and the opium prevents any further irritation, which might give rise to purging. Should, however, the catarrh prove more persistent, we must try something else, taking care of course that the stomach is doing its duty and not sending on fermenting or putrefying food to keep up the irritation; then the pil. plumbi cum opio in four-grain doses, or pulvis ipecacuanhæ co. in five-grain doses, are by far the best remedies. In summer, when intestinal catarrh is most common, every man has his own remedy, as almost any astringent will suffice—so one man prescribes mistura cretæ, another sulphuric acid lemonade; it matters not greatly which if the cause of irritation has been removed. Diet should be in some measure attended to, at least to the extent of excluding substances notoriously injurious to digestion, including unripe fruit and vegetables, stale fish, and the like. Beyond this in ordinary cases we need hardly go.

Chronic intestinal catarrh in the adult is too often overlooked. As constipation is one of its most marked indications, the first thing we must try to do is to get the bowels to move. Here again it is better to use gentle remedies persistently than to make use of drastic purgatives, which are only likely to aggravate the condition. Castor-oil should be prescribed, but in larger dose than in simple catarrh, so as to procure at least one free and copious motion. When, however, we have reason to believe that the great gut is in part the site of the mischief, as indicated by griping pains in that region, mucous and bloody stools and tenesmus, we had better give an enema. This enema may consist of half an ounce of castor-oil, half an ounce of oil of turpentine, beaten up with a couple of eggs, and made up to a pint with water at temp. 100° Fahr. This enema should be injected slowly and steadily with as long a pipe as possible, and the patient kept quiet thereafter. In other cases a simple soap-and-water enema may suffice. When the bowels have been well moved, when no more scybalous masses are coming away,

we may hope to do something by diet to promote the action of the bowels. We have already tried to explain that a diet which contains too much indigestible matter is apt to irritate the bowels, whilst if it contains too little the bowels have not stimulus enough. Most frequently the error lies in the latter way, and so we prescribe brown bread, well-cooked vegetables, and the like. Exercise too on foot is of great importance, and still more so is the habit of having the bowels moved regularly at a certain time. With some men a morning cigar is an invariable laxative, greatly we believe from the habit of the thing. At all events, it should be regularly attempted at a given time. In many, however, this will not suffice, and we must by a series of what must be called experiments on the individual himself find out what remedies suit him best, always bearing in mind the golden rule—to be content with the least potent drug which secures the desired effect; as well as another rule of equal value—that no single remedy will suffice for this purpose for any length of time. Sometimes remedies apparently little likely to have a laxative effect are valuable in this form of constipation; foremost among these is belladonna, given in the form of pill, each containing about ¼ grain of the extract, either by itself or in combination with some other remedy.

Chronic intestinal catarrh in children is almost invariably associated with the chronic gastric catarrh already spoken of, and the remedies are similar. Sour coagulated milk is generally at the root of the mischief, and lime-water is the best means of preventing both, but the diet should not consist exclusively of milk; beef-tea and mutton or chicken broth should also be given, and if necessary milk entirely abandoned for the time being. Even in the worst cases grated meat, especially grated or very finely chopped raw mutton, will do wonders. Such patients too commonly require wine; this is best given as wine-whey. Half a pint of good milk should be placed on the fire and raised nearly to the boiling point. Before that is reached, however, from half a glass to a glass of good sherry should be thrown into the same pan with the milk. This coagulates the casein, which is to be carefully separated as curd, and the whey used as a stimulant in table-spoonful doses.

In catarrh of the colon we may try castor-oil, but we must trust to enemata. Sometimes it is necessary to

break down the hardened mass in the rectum by mechanical means. But if there is (as most frequently happens) along with the constipation some amount of diarrhœa, we may be misled till we see the result of the enema. Again and again enemata should be used, making them larger and larger as the gut is gradually cleared upwards, and using as their only constituents hot soap-and-water, or hot milk-and-water. Cases where such persistent treatment is necessary are, however, rare; a few injections, if tolerably copious and skilfully thrown up—there is much in that—generally suffice. If any irritation remain behind, a suppository containing opium, or better still, a small starch and laudanum enema will suffice to arrest it. Our purpose in every case is to remove the irritant substances with as little trouble to the bowel as possible, and as soon as they have been removed to stop any further motion in the bowels, which might only aggravate matters.

ULCERATIVE ENTERITIS.

Inflammation of the intestinal mucous membrane may, however, assume even a graver type. In the great intestine especially, it is prone to assume the *croupous* form, to cause *sloughing*, and to produce *ulcers*.

The substance of the membrane is here involved; that dies and sloughs, the sloughs are thrown off, and superficial ulcerations are left. The grey sloughs in the reddened mucous membrane are very striking; they most frequently occur in the great intestine, on the surface of the edges projecting into the gut, forming patches of varying shapes and dimensions—most frequently linear and of no very great size.

Here the pain is very severe, and located in the lower portion of the abdomen, the sphincter ani is spasmodically contracted, the motions, which are bloody and contain shreds of sloughy tissue as well as mucus, are passed with great pain and severe straining (*tenesmus*). The passage of a motion only gives temporary relief, for the pain quickly returns and persists. In this form of the malady lumps of hardened fæces (*scybala*) which seem to have originated the mischief, are from time to time passed with momentary relief.

But ulceration may occur elsewhere and from other causes. We shall not here do more than allude to the *per-*

forating ulcer of the duodenum, in most respects closely allied and similar to the same kind of ulcer in the stomach, and in all probability due to exactly the same causes, for it occurs, with rare exceptions, only in the duodenum above the level of the openings of the pancreatic and bile ducts, at a spot where yet the acid gastric juice has not had time to be neutralized. There is a belief that such ulcers are particularly common after burns. Most frequently they give no sure indication of their existence until they give rise to fatal hæmorrhage or perforation and peritonitis.

The ulcers which arise from simple enteritis are of two kinds, *diffuse* and *follicular*. The former are most frequently dependent on direct contact of some irritant substance, whether a foreign body in the strict sense of the word, or such as hardened fæces. The mucous membrane becomes dark and swollen; it softens and breaks down with or without distinct suppuration, and so a rounded or irregular-looking ulcer is formed. Sometimes these occur in considerable numbers, especially in the large intestine, so that the congested mucous membrane which remains forms what looks like a network of inflamed tissue, the ulcerated surface being excavated, grey, and shreddy-looking in appearance, and having sometimes the edges undermined. One tolerably characteristic variety of the intestinal ulcer is that known as the *follicular*, which is found, with rare exceptions, in the great gut only. The follicles of this portion of the intestine become enlarged and prominent, surrounded by a dark, congested line; pus forms in the interior of the swelling, and makes its way into the bowel, leaving behind a small round ulcer, which tends to enlarge, to become irregular, and if many occur in the same neighbourhood to widely involve the mucous membrane of the gut. In yet another form of ulcer sloughing from extravasation of blood or extreme congestion, particularly on the free margin of the intestinal folds, occurs. In one set of cases only a small slough forms, and a small ulcerated surface is left, but in the large intestines we may find great patches so laid bare, exposing extensive raw surfaces.

The appearance of the various kinds of ulcers varies with their stage and tendencies. Most of the simple erosions rapidly heal, their surface becomes smooth and clean, granulations form, and a cicatrix results. In other

cases they tend to spread, involving more and more of the mucous membrane, or piercing deeper and deeper till perforation takes place and extravasation of contents follows if peritonitis and adhesion have not already averted that danger. If tending to spread, the mucous membrane in the neighbourhood of an ulcer is usually congested or tending to slough; whilst if perforation is likely to occur, first the transverse, then the longitudinal muscular fibres are exposed. Still another result is seen, especially when a very large extent of surface has been exposed, as often happens in the great intestine. In such there may be no indication of any attempt at healing, and the surface remains raw to the end of life. In yet other cases, the ulcer may assume chronic characters, ready, however, to break out afresh into active existence if any irritation sets up fresh ulcerative action; or it may heal altogether, leaving a contracting cicatrix to set up an obstruction to the motions of the intestinal contents. When an ulcer tends to perforate (especially in those which occur in typhoid) layer after layer of the intestine softens and breaks down, sometimes by ulceration, sometimes by sloughing, till the peritoneum is reached. This usually gives way by rupture rather than the processes just alluded to; but most frequently there has been some adhesions beforehand, so that extravasation does not take place directly. Very often, however, the ulcerative process continues, and in this way a communication is formed between one portion of the gut and another, either directly, or by means of a sac filled with pus, lying between the two; such communications may form between any two parts of the gut, or with adjacent organs.

The *signs* of *ulcerative enteritis* vary exceedingly, chiefly according to the site of the mischief. Thus, if high up there may be absolutely no sign of the ulceration; sometimes there is a little tenderness, but this is not much to be relied upon. If lower down, especially if the great gut be involved, we are almost sure to have diarrhœa; but as we have pointed out, constipation—*i.e.*, the irritant effect of hardened fæces—is one of the prime causes of ulcerative inflammation of the colon; and the constipation may persist even to the end. When the bowels are loose, the stools are generally pea-soup-like, extremely fœtid, and sometimes contain blood. If the lower part of the colon be alone affected, then are the stools more mucous, more scanty, and contain less feculent

matter, whilst they are passed with greater tenesmus; moreover, they much more frequently contain blood in the form of smear, or small isolated mass, or mixed up with the motion. The smell of such motions too is very offensive, sometimes hardly bearable. The follicular ulcer has symptoms in the earlier stages peculiar to itself. At first they are those of simple intestinal catarrh, but by-and-by peculiar sago-like masses are mixed with the mucous stools; later the stools become more chylous in appearance, the mucus is not so tenacious and more puriform, becoming opaque and yellowish-white with occasional particles of fæces, which are sometimes passed in bulk. If these ulcers heal, contraction and obstruction generally follow.

There is, however, one form of ulceration of the intestine so characteristically that arising from constipation, that it may be taken as a type of all. We have seen that the parts most readily becoming ulcerous are, the upper part of the colon and the lower part of the ileum, the cæcum from various causes being peculiarly liable to ulcerative inflammation. Here it is perhaps that fæces are most prone to collect and harden, and if the process has begun elsewhere in the great intestine the collection in the cæcum is almost always the last to disappear. To inflammation arising in the cæcum from collections of fæces the name *typhlitis stercoralis* has been given—the former part of the title applying to the cæcum generally. Such collections of fæces are most apt to form in old women, who take little exercise and neglect their bowels. Often, they are indicated first of all, besides the consequent constipation, by fits of pain; but quite as often these are absent. From the permanent distension the muscular coat loses its contractile power, and the longer the mass remains the more it tends to harden. At the same time we may probably have some diarrhœa from irritation of the gut at the lower end of this fæcal accumulation, so that the existence of diarrhœa often masks its real cause—constipation. However that be, the impacted mass acts as a complete obstruction to the bowels; the contents of the small intestine can reach no further than the ileum, regurgitation is set up, and vomiting soon comes on. At first, the matters vomited are the contents of the stomach mixed with bile, but soon, if the condition is not bettered, a fluid having a fæcal odour, brownish and disagreeable, but without the consistence of fæces is ejected. Such symptoms indicate obstruction, and the site we must try to

discover. In some cases this is difficult, in most others easy, for the pain in the right groin by this time is very decided, and if we attempt to mark out the spot by palpation and percussion we speedily discover a hard tumour, due to the aggregation of the fæces. Pressure is painful and the patient shrinks from it; but even with light palpation we can make out a tumour, more or less elongated, extending from the right groin in the direction of the ribs on the right side. If at this stage the bowels can be got to move, improvement is rapid, vomiting ceases, and though some part of the mass may persist, still it gradually disappears, and the patient recovers. But again, instead of this we sometimes find the inflammation extending to the serous covering, where it exists around the cæcum, and to the connective tissue where it does not, setting up peritonitis and what is called perityphlitis. The peritonitis is indicated by the extreme tenderness which gradually extends over the abdomen, whilst the perityphlitis gives rise to a brawny thickening of the muscles in the right flank, which completely prevents anything like an attempt to move the thigh on the body. Both of these sets of symptoms may subside, but sometimes the peritonitis proves fatal, and sometimes an abscess forms round the head of the cæcum, whence—if not allowed to escape—the pus may burrow in various directions. In this form of typhlitis perforation is rare, and the peritonitis is not so severe as when the contents of the bowel escape. Inflammation of the vermiform process is not very uncommon; small hard bodies are apt to become fixed there (it has been called a trap for cherry-stones) and to set up inflammatory mischief. Here the symptoms somewhat resemble those of typhlitis and perityphlitis, save that, the cause being different, there is no tumour and but little tenderness on pressure. Perforation is apt to occur in this malady, but no great escape of contents can take place, and the perforation is usually very gradual, so that the peritonitis may not be so very severe.

We are hardly here called upon to describe that form of enteritis which ensues on strangulation of the gut from whatever cause, and which, arresting all downward passage, gives rise to the signs already indicated. It begins externally and spreads internally, and sometimes ends in gangrene.

Treatment.—In *typhlitis* when there is much pain on pressure and that pain tends to spread towards the mediar

line, nothing does so much good as a few leeches, whilst over the region of connective tissue, that is, towards the back, an opiate poultice seems best to ease the parts. When pus forms it should be promptly evacuated. In the more severe forms of enteritis, especially those where we have the whole thickness of the gut affected, there is but one remedy to trust to, that is opium. Very likely it cannot be retained, if given by the stomach, but then it must be given subcutaneously. It is not so desirable to give it by the rectum unless we can be sure that the ulceration is not due to fæcal accumulation, which can be relieved by enemata.

In the treatment of inflammation of the great intestine, which resembles dysentery, and is due to ulceration of the follicular or other kind, enemata of astringents are most valuable. Decoction of oak bark and alum is a good one; still better is one composed of nitrate of silver, if we can make sure of its reaching the affected spot.

PERITYPHLITIS AND PERIPROCTITIS.

It has been mentioned that inflammation of the cæcum is apt to extend to the connective tissue partly surrounding it. This is called perityphlitis, and the same accident may happen to the rectum, when the mischief is termed periproctitis. It is well to be aware of the possibility of such accidents, and of their course. Sometimes the inflammation, after giving rise to a brawny hardness, subsides, leaving the individual with the part stiffened, hard, and somewhat painful, but otherwise well. In other cases pus may form and burrow upwards behind the kidneys towards the ribs, or downwards and forwards into the groin, where if not previously relieved the abscess may open; but it may also open into the peritoneum, when the result is fatal, or into the gut, when all may be well. Such evils are best avoided; if abscess does form it is best to evacuate it promptly, even taking the risk that there is no matter present, after which the patient usually does well. The early treatment resolves itself into the local treatment of typhlitis. In periproctitis, which is rarer, we find a tumour in the perineum, or by means of the fingers in the rectum. It is by this mechanism that fistulæ are formed. In chronic cases there is great thickening and induration of the connective tissue round the gut, and consequent stricture of the rectum, with all its painful results.

OBSTRUCTION OF THE BOWELS.

The bowels may become obstructed from a great variety of causes. In speaking of enteritis, we have seen that *retained and hardened fæces* may effectually obstruct all passage downwards. It is at once a cause and a consequence of obstruction. Closely allied to this as a cause of obstruction, are foreign bodies impacted in the gut. These foreign bodies may in one sense be not foreign at all, consisting of imperfectly digested food, but we sometimes find others more distinctly foreign. In Scotland, when oatmeal was badly prepared, rounded balls composed of the husks of oats were not uncommonly found in the intestine; just as balls made of hair are sometimes found in those of cattle which have been accustomed to lick themselves, and swallow the hair. Similar to these are the cases of hysterical women who have swallowed hair, string, and the like; whilst in yet other cases bulky powders, as carbonate of iron and magnesia, are said to have formed concretions. More frequently, however, obstruction has followed the introduction of a great gall stone into the bowel after it has eaten its way by ulceration, through the gall bladder, and coats of the intestine. These often make their way as far as the ilio-cæcal valve, but are arrested there, and soon set up all the signs of intestinal obstruction, with it may be ulcerations of the ileum. If they pass the ilio-cæcal valve, they are usually voided, but probably the very large ones thus passed have made their way directly from the gall bladder into the great gut. Still another form of obstruction may be said to occur from causes nearly natural—*i.e.*, from direct pressure on the gut. Such is the case when the uterus is enlarged by pregnancy; or when it is retroflexed and presses directly against the rectum. Still other modes of compression may occur, as by a large fibroid tumour in the posterior wall of the uterus, or by a collection of matter in Douglas's pouch.

The special causes of obstruction connected with the bowel itself are *stricture, twisting, internal strangulation,* and *intussusception. Strictures* are of two kinds—those arising from a cicatrix, and those arising from a new growth, cancerous, or otherwise. The healing of large ulcers, particularly those connected with the dysenteric form of enteritis, very often result in stricture, and so probably do extensive scrofulous ulcerations whenever they do heal, but the cicatrix of a typhoid ulcer neve-

gives rise to any obstruction. Syphilis is assigned as a cause, though not a very frequent one, of stricture of the gut, particularly the rectum. The characters of such cicatrices do not differ from those of cicatrices elsewhere; they consist of dense contracting connective tissue, with sometimes an unhealed ulcerous spot on the surface. What might be called an external stricture, more or less complete, is the mode in which chronic peritonitis tends to terminate.

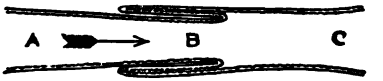
New growths of a malignant kind are elsewhere discussed.

Another very important cause of obstruction is *twisting*. The intestine may be twisted on its own axis, folded back on the mesentery as it were, or as more frequently happens, especially with a long and lax mesentery, a loop of intestine becomes twisted round its mesentery, or yet again one portion of intestine may be twisted round another. How this is effected we hardly know, and its very existence is apt to escape notice when the intestines unroll, as they are apt to do when the post-mortem examination of the abdomen begins. Sometimes, however, it happens, that there has been a sufficient degree of peritonitis to glue the parts together; but even then a little force will separate the adhesions, and allow the bowel to unroll itself.

Closely allied to the preceding is *internal strangulation*, due not to twisting, but to constriction of the gut by some structure other than itself. Thus a knuckle of gut may enter the foramen of Winslow, or some fissure in the omentum or mesentery, and there become strangulated; or, as we sometimes see, a band formed of some protrusion of the bowel, having become adherent at its extremity, may cause the same kind of mischief; or yet again fibrous bands, the result of previous peritonitis, may produce it.

Finally we have *intussusception* or *invagination*, where one portion of gut is drawn into another as we can draw the point of the finger of a glove backwards into the finger itself, the point still projecting beyond this. The condition is not easily described, but is easily figured diagrammatically, A being the upper portion of the gut; B that portion of it which has been drawn into or invaginated in C, the lower portion of the bowel. Between the sheath, as it is called, and the portion of gut invaginated, we find the mucous membrane of the bowel indicated by the roughened surface. Between the two

doubled-in surfaces of the invaginated portion lie the smooth serous coat of the peritoneum, and the mesentery.



Finally, in the innermost tube of all we find the ordinary mucous membrane of the bowel. Sometimes the small gut is invaginated in the large one to such an extent that the ilio-cæcal valve presents at the anus. Such accidents are most frequent in children, especially in those of feeble growth, and relaxed condition. In these cases the mesentery being attached to one side of the invaginated bowel, tends to drag it to that side, and so at once to give a curved form to the invaginated portion, the concavity of the curve being towards the mesentery, and at the same time to alter the shape of the lumen or channel of the bowel from its ordinary circular shape to one more elongated in a transverse direction.

The symptoms of these various forms of obstruction vary greatly, and on them we must rely for the differential diagnosis of the different affections which have the one common symptom of resisting the passage of the intestinal contents. The first of these obstructive conditions, *constipation*, we have already discussed. It is necessary, however, to bear in mind that what would be intolerable constipation in one would be nothing of the kind in another; but in all cases, sooner or later, its symptoms show themselves, it may be in the comparatively slight form of discomfort, headache, furred tongue, and foul breath, or in the more severe forms we have mentioned above, vomiting, prostration, &c., symptoms of what is called *ileus* or in ulceration. In habitual constipation, or even in the constipation which is not habitual, one of the most troublesome things is the feeling, even when the bowels are opened, that all the accumulated fæces have not passed away, what remains behind being all the more ready to harden and to aggravate the condition. When the rectum becomes loaded and distended we may have a new crop of symptoms arising from interference with the circulation in the pelvic organs, such as piles, congestion of the uterus, interference with the bladder, and the like. The most important causes of constipation, besides those already mentioned, is loss of power in the abdominal or intestinal muscles, or habitual neglect of the bowels, which is apt to end in the former.

Stricture of course is a very much more serious thing than simple constipation, though it is wonderful how long, if the balance be properly preserved, all the functions of life may be carried on with only an orifice not larger than a goose quill, especially if this occurs in the small intestine, where the contents of the bowel are more fluid than lower down. The symptoms of simple stricture are, however, by no means conclusive, except the obstacle be very low down, when we obtain some aid from the appearance of the fæces. In habitual constipation the motions when passed are large, cylindrical masses, but in stricture of the rectum the motions are thin and taper-like or pipe-like, or in small round masses like sheep's-dung. The existence of stricture is the more probable in all cases if we can make out a history of antecedent ulceration. If low down, too, examination by the finger or bougie may enable the site of the stricture to be made out; and, in every case such examination should be employed to make out whether there is anything the matter with the neighbouring organs. The symptoms of complete obstruction in cases of stricture sometimes come on suddenly, in other instances they make their appearance very gradually. Thus we may have, in the first place, some colicky pain coming and going, with slight nausea and a tendency to constipation. Often we are able to make out a gradual accumulation of fæces at some particular part of the intestine just above the stricture. By-and-by the pain and swelling of the bowels become greater, the latter being sometimes distinctly visible through the walls of the abdomen. Vomiting begins, when the ejected matters consist, first of food and bile, later of fæces. At last the face becomes contracted and sunken, the surface covered with a cold sweat, and the pulse is imperceptible. Death follows from exhaustion. In these cases no inflammation complicates the attack; when it does we have great tenderness, swollen abdomen, quick pulse, and high temperature; the patient, instead of tossing about, lies as still as possible, and if perforation has occurred there is more or less complete collapse. In these cases, too, it is important to bear in mind that the symptoms of peritoneal inflammation completely obscure those of obstruction, so that the cause of the peritonitis is apt to be overlooked. In such cases death is more speedy than when there is no peritonitis.

Twisting and internal strangulation are less frequent phenomena than stricture. The symptoms to which they

give rise are essentially those which it is the custom in this country to call enteritis. These are, pain in the abdomen of a very severe character, coming on suddenly, increased by movement or pressure, constipation, nausea and vomiting, tympanites, and quick pulse. The pain and tenderness may by degrees cease, but the vomiting continues and becomes fæcal, or at all events brownish coloured and of a fæcal odour. Hiccup comes on, there is complete collapse with hardly perceptible pulse, cold and damp skin, and gradual exhaustion. These are also the symptoms of external strangulated hernia, and as external hernia is far more common than internal it behoves us to make a most careful examination, to ascertain if any such exists, for it is mainly by exclusion that we are able to make an accurate diagnosis. Neither in constipation nor simple stricture have we that constitutional disturbance which indicates inflammation of the peritoneum, but in strangulation this is an early and most notable indication.

Intussusception or invagination of the bowel may also be diagnosed in some cases, but not in all. In the first place, it is most apt to occur in flabby children, the obstruction in invagination need not be complete; for though the part of the bowel invaginated has no power by its contraction to drive on the matters which pass into it, the vis à tergo arising from the increased violence in the contraction of the muscular coat just above the invaginated portion of gut, may be sufficient to make a considerable bulk of matter pass onwards. Gases pass still more easily, so that there is seldom that degree of tympanitic distension just above the obstruction which we find in stricture and strangulation. Certain peculiar features too are due to the peculiarity of the mischief. As already pointed out, the mesentery is included between the two inner layers of the invaginated gut, so that all egress of blood from that is prevented, whilst the heart's action may be powerful enough to drive in a fair amount into its arteries before the vessels become completely blocked. In a short time, however, obstruction occurs, so that the two inner layers are completely blackened from venous congestion and escape of blood into their substance; this also causes them to swell and prevents anything like an attempt at reduction. Inflammation too is set up, the invaginated portions become glued together and sometimes slough off, leaving the gut shorter by so much. The cause of intussusception seems to be unusual openness

or relaxation of one part of the tube, and downward straining or excessive motion in the part just above. This in turn may be aided by the usual longitudinal or upward vermicular motion—an essential portion of the so-called peristaltic action. Various other causes may combine to aid these, but such seem the essential elements in the accident. When once invagination has occurred the movements of the imprisoned bowel only serve to aggravate the mischief; more and more bowel descends, the sheath tends to grasp more and more of the descending portion, and so to invaginate it more and more. When the congestion is excessive, the blood effused may show itself in the stools (and this almost invariably happens), and so be of some value as a diagnostic, particularly if we can make out an elongated cylindrical mass connected with the lower portion of the small intestine or upper part of the colon, the most common sites of intussusception. If we have the symptoms of obstruction and a tumour coming on suddenly, and still more particularly if we have imperfect closure of the bowels, bloody stools (with or without the signs of peritonitis), and *some degree of resonance in the tumour*, we may fairly diagnose intussusception. The diagnosis is of course more certain if we can see or feel the invagination from the anus.

As not unfrequently we find intussusceptions after death of which there have been no signs during life, and which have given rise to little or no peritoneal irritation, there is ground for believing that in some cases they may come and go without being indicated by more marked signs than those of temporary intestinal obstruction. Intussusception may occur in almost any part of the bowel, but if it happen in the small intestine strangulation and sloughing, with their signs, are much more likely to follow, and to follow abruptly, than when it takes place in the great gut. Sometimes indeed we find a whole length of small intestine passed, though the quantity of intestine involved as a rule is less than when the great intestine is concerned; but in this last case we have to deal with the signs of obstruction rather than strangulation, though sometimes the motions may be restored in a modified form before death occurs. When sloughing occurs, the part involved comes away either as a whole or bit by bit, leaving an ulcerated surface where the sheath has joined the gut just above the invagination. Usually the union is complete, but it may not be so, and so escape of the intestinal contents may occur. Yet another accident may follow from the contraction of the healing ulcer, that

is permanent obstruction, and death may result therefrom.

Treatment.—The treatment of *obstruction of the bowels* must vary with the cause. Enough has already been said with regard to *constipation*. The essential points in its management is this—we must trust to enemata rather than to purgatives, for strong purgatives (supposing the case is not one of constipation) may do irremediable damage. Castor-oil is not, however, likely to do much harm. Another fact is, however, available here. We have seen that perhaps the great cause of constipation is want of power in the muscular coat; now there is a condition in which this is a prominent feature—we mean in flatulent distension. If the bowels be distended with foul gases they cannot contract on their contents to expel them, and the gases are often very difficult of expulsion, particularly if there is a stricture. Under such circumstances we may try the effect of relieving the bowel by puncturing with a very fine trocar, such as is used in aspiration, and so allowing the flatus to escape. Certain it is that we have seen such procedure followed by a copious motion where the bowels were before obstinately confined, and the condition of the patient pass from that of impending death to comparative comfort. When there is *stricture* much of our success in treatment will depend on its site; if in the small intestine, we must strive to keep the matters therein contained as fluid as possible, and by no means to allow of any degree of accumulation. To this end the food should be as pulpy as possible, and should contain as little indigestible matter as possible, the ordinary stimulant effects of this on the gut being supplied by something else, particularly castor-oil. But should there be any tendency to diarrhœa, that should be promptly checked, best by boiled milk and lime-water, to which a drop or two of laudanum may be added if necessary; but the least amount of opium that will suffice is enough—anything more does harm. If the stricture lie low down in the bowel, especially if in the great intestine, repeated enemata (or lavements, as they used to be called) of soap and warm water are both soothing and useful; for in the great intestine the contents are more distinctly fæcal than in the small, and tend to assume a firmer consistence—hence the value of softening agents in keeping the stricture permeable. Here the bulk of the enema is of considerable importance, and to enable a bulky enema

to be introduced it must be injected slowly and skilfully with as long a tube as possible. If within the reach of bougie direct dilatation may be tried, but experience says this is hardly satisfactory. In the last extreme the bowel may be opened rather high up and in the groin, or low down and in the back. Undoubtedly the latter is the preferable operation, and has now been done so often and with such good results in all kinds of rectal mischief, that it may be considered a standing operation quite as much as amputation of the leg is.

When we have to deal with *internal strangulation*, our diagnosis as to the non-existence of external strangulation being strictly confirmed, the brilliant results which follow operations for the latter must force themselves upon our mind. Moreover, we have now sufficient experience of abdominal surgery, especially ovariotomy, to have overcome the dread our predecessors had of interfering with the peritoneal cavity. In point of fact the abdomen has been opened, the strangulation has been removed, and the patient done well, in a sufficient number of instances, to justify us in having recourse to like procedure. We must, however, be guided by circumstances as to whether the strangulated portion of gut should be returned to the abdomen or no. But if we are to succeed in this plan, it is important that the operation should be early. If we have much peritonitis, it may be of no avail, or even impracticable; therefore let us make up our minds early, first, that we have to deal with a case which justifies interference, and secondly, whether or no, taking all things into consideration, we shall do better with or without operation. But whether with or without operation, we have a remedy of invaluable power in opium. That should be administered freely, even unto narcotism, subcutaneously; not, however, in large and powerful doses, but in small quantities frequently repeated, whilst the bowels are kept quiet and the inflammation kept down by extensive application of ice to the abdomen. Ice internally and ice externally is again the rule.

In dealing with *intussusception*, we must bear in mind the tendencies of the disease—if in the small intestine, to inflammation, sloughing, and evacuation; if in the great intestine, to produce more or less obstruction, but less inflammation. If, therefore, we have the signs of inflammation prominent, we must again trust to opium and cold to mitigate its intensity and tendency to spread, though in sloughing lies our only hope of a successful

issue. But if we have little or no indication of inflammation, whilst the other signs point to invagination of a portion of gut, especially the colon, we must try what we can do to return the invaginated portion before the condition becomes permanent. Here copious enemata and insufflation of air by bellows have been recommended, and may be successful. But there can be no doubt but that an operation offers at least a hope of success. In children the mere return by a bougie and probang may be possible, but in the adult we need something more; and here, if we be assured of the condition of the patient, the conclusion is forced upon us that we ought to try by opening the abdomen to return the bowel to its natural position. Such operations have been successful, and they constitute the only hopeful mode of interference where the small intestine is concerned.

MALIGNANT DISEASE OF THE BOWEL.

Cancer, in the strict sense of the word, is not nearly so common in the intestines as in the stomach, nevertheless it not unfrequently attacks the great gut, especially the rectum in its sigmoid flexure. Cancer of the peritoneum too, may invade the wall of the intestine, though seldom to any marked extent. Malignant growths are most frequent on the side where the mesentery is attached, though sometimes they are found to correspond with Peyer's patches. If they originate in the intestine itself, the mischief begins in the submucous tissue, and tends to grow thence round about and along the gut so as to encircle it with a mass of cancerous tissue perforated by the intestinal canal, which is thus sooner or later greatly contracted. The mass tends to assume a more or less irregularly rounded or cylindrical shape. The mucous membrane is sooner or later involved, and sloughs away, leaving the surface of the cancer itself exposed, which again may slough, and so enlarge the calibre of the previously contracted gut. From the edges of this cancerous mass, which is usually of the hard or scirrhous kind, sprouts of a more spongy or medullary character often make their appearance. These new growths often soften and break down, but if they grow externally, or set up peritonitis, causing adherence to neighbouring organs, this may prevent escape of fæcal matters, whilst communications are formed between one portion of the gut and another. Before this happens, however, the signs of stricture are commonly observed: the gut enlarges,

fæces and flatus accumulate, whilst below the contracted spot the bowel is empty and collapsed. Instead of scirrhus we sometimes encounter a new growth, medullary or colloid in character, even from the beginning. The former does not tend to encircle and contract the calibre of the gut, but to form projections into its interior. Colloid, as in the stomach, tends to involve an extensive tract of the bowel rather than to form any projection. Still another variety of malignant growth occurs in the rectum; this is what is called villous cancer; the elements are the same as in the ordinary form of the disease, but tend to assume a villous or shaggy appearance. Some of the villous growths are, however, of what might be called a benign or non-malignant character.

The symptoms of cancer of the bowel are often very obscure, and we are only enlightened as to the cause of the disease after death. There is usually pain and constipation, the latter depending on impaired power in the muscular coat from infiltration even before stricture opposes the passage of the intestinal contents. This constipation is exceedingly troublesome, and often seems to the patient the sole cause of his illness. The fits tend to recur more and more severely, each attack being overcome with more and more difficulty, until at last it becomes permanent, and death follows. In some patients the cachexia is very well marked, but as an earthy complexion is common in those who suffer from abdominal diseases, particularly those interfering with nutrition, this is not such a good criterion as could be desired. If we can discover a rounded nodulated mass, with signs of tympanites just above it, this helps us to a diagnosis, but even then we are at a loss to determine the exact site of the mischief. It is to be noted that such cancerous tumours as encircle the gut, and do not project into it only, are partly resonant on percussion—a most important fact in forming a diagnosis. When lower down, as in the rectum, the cancerous mass may be within reach of examination by finger or speculum—both most important aids to diagnosis. But even without these, pains in the region of the sacrum, gradually increasing constipation, with diminution in the bulk of the fæces passed, these being often bloody, and passed with great pain, lead inevitably to the same conclusion. Few conditions are more miserable than that of cancer of the rectum, especially when it has spread to neighbouring organs, more particularly the bladder. Life is then one continuous torment, which opium can only faintly relieve

Death in all cases comes sooner or later, sometimes in one way, sometimes in another; sometimes from ileus—*i.e.*, obstruction and regurgitation, sometimes from wasting, sometimes from bleeding, sometimes from peritonitis—in all, death is only a question of time and of more or less misery.

The *treatment* of cancer of the bowel resolves itself into palliation of symptoms by the various narcotics we possess, especially opium, given by the bowel or subcutaneously. The food too should be as little bulky as possible, whilst any tendency to constipation should be strenuously combated, best of all by castor-oil. When the disease lies low down in the great gut, the operation for artificial anus promises, and if successful affords, unspeakable relief, altogether apart from the chance of its permanent success should the stricture prove non-malignant.

INTESTINAL HÆMORRHAGES—PILES.

Hæmorrhage from the vessels of the intestine may occur from a variety of causes—first, from distinct lesion of its walls—as in ulceration, whether duodenal and perforating, dysenteric, or typhoid, whereas bleeding from strumous ulcers is very rare. Again, we may have bleeding from congestion of the portal system, as in cirrhosis, or from change in the vessels or blood, as in scurvy. But the most frequent bleedings take place from the hæmorrhoidal veins at the lower end of the gut, and may there arise from various causes. First, we may have congestion of these veins, the radicles of the portal system, produced by whatever interferes with local venous circulation, as over-distension of the bowel with fæces, pressure of the enlarged pregnant or retroflexed uterus, pelvic tumours of various kinds, and the like. Acting more remotely are such causes as cirrhosis of the liver—a very common cause of piles; or yet again these may arise from obstruction to the circulation in the lungs or heart. Such, however, are not the only causes, for some people may have any of these and yet suffer not the least from piles. Generally we must throw in a certain weakness in the walls of the vessels, whether congenital or acquired, perhaps from chronic irritation of the tissues in which the vessels lie. Piles do certainly also occur from causes not readily explainable, in individuals who indulge in over-living and take little exercise; but as in these the circulation is sluggish, the bowels generally confined, with a tendency

to congestion in most of the internal organs, we are fain to assign these or similar morbid changes as the origin of the hæmorrhoidal swellings we call piles.

Intestinal hæmorrhages are either capillary, as in those owing to congestion, or due to more manifest lesions, as ulcers or malignant growths. In the latter case we often see (if perhaps we except the typhoid ulcer) the orifice of an open vessel which has given rise to the fatal hæmorrhage. Together with capillary hæmorrhage we find effusion into the substance of the mucous membrane, and the surface and edges of a bleeding ulcer are usually similarly infiltrated. The blood may, moreover, be sometimes seen in the latter case adhering in the form of a clot to the ulcer; otherwise we rarely see it in this state, for it is speedily altered by the intestinal fluids to a dark brown or black tar-like mass.

Bleeding from the rectum, if not due to ulceration, is usually due to *piles*. These are enlargements or varicosities of the hæmorrhoidal veins, sometimes situated within the anus, sometimes without, and so distinguished as *internal* and *external*. Both kinds are varicosities, but internal piles, though at first broad, may be pressed down and become elongated, whilst the bowels are being moved; the submucous connective tissue yields, so that there is gradually formed a kind of pedicle to the button-like varicosities. These may either withdraw within the anus after defecation, or remain permanently without it. If the piles are large, strangulation from the grasp of the sphincter with all its consequent evils may follow, or ulcers may form at their roots to set up inflammation and all kinds of mischief round about the rectum. External piles at first tend to come and go; the vessels are then thin-walled, but after a time thicken and change their appearance from blue to white. Frequently these vessels unite so as to form a varicose ring round the margin of the anus, or even large venous sinuses. Occasionally a kind of self-cure is observed; thrombosis occurs, the veins are stopped up, and either softening and disintegration, with ulceration follow, or, as we have reason to believe, gradual absorption may take place, leaving behind merely a troublesome fold of skin.

An attack or fit of piles, as it is called, may be brought on in a variety of ways, perhaps in none more readily than by sitting on a cold, damp seat. Then follows a heavy burning pain around the anus, the patient cannot sit with

comfort, particularly on a hard seat, but tries by sitting on one hip or on a hollow cushion to relieve all pressure around the anus. Any motion of the bowels is exquisitely painful, the burning pain thus produced very slowly subsiding, and this even if the motion be soft. If it be hard and bulky the pain is hardly bearable; and unfortunately patients dread having their bowels moved, and so postpone it as long as possible, thus inducing constipation and hard and bulky motions. External and internal piles often co-exist, separated from each other by the sphincter ani only; whilst if the sphincter be relaxed so that the internal piles protrude they appear, if numerous, as a bunch of reddish growths with no distinct line of demarcation. They are then of a rounded form, generally of a deep purple hue, and bleed freely: they also yield a kind of watery, semi-purulent secretion.

Bleeding from internal piles is one of their most frequent and characteristic symptoms. It commonly occurs during defecation only, and may be either capillary, yielding but a few drops of blood—or the varicose veins may burst and rather copious bleeding ensue. It is only in rare instances and when frequently repeated that this becomes dangerous. Piles may be in existence for years without troubling the patient much, but if from constipation, portal congestion, or even cold, any unusual congestion in the region of the rectum be set up, they forthwith make their presence unpleasantly apparent. In some, however, a "fit of the piles" is a safeguard from worse evils. This is especially the case in individuals of full habit who live too well. After the usual unpleasant feelings the piles discharge a quantity of black blood, and the patient straightway feels himself relieved. When, however, the bleeding is arterial in character it is apt to become dangerous, and should be as far as possible prevented.

Treatment.—For intestinal hæmorrhage arising from portal congestion the best remedy is sulphuric acid with sulphate of magnesia, given so as to purge freely. Ulcers have already been spoken of. In the case of piles which are small and give little inconvenience, all we have to do is to keep the bowels open and to regulate the diet. To most patients highly spiced food and heating spirituous liquors are injurious and to be avoided. They should live plainly, and take abundant exercise. Sitting on hot cushioned seats is most injurious; the patient, if of a

sedentary occupation, should always use a caned chair. Drastic purgatives, particularly aloetic ones, are to be avoided. In their place we should use such simple remedies as sulphur, electuary of senna, or sulphur, cream of tartar, and honey. When the portal system is gorged, a seidlitz powder will often give relief, or in its place a dose of Friedreichshall or Püllna water may be taken every morning. Locally, astringent ointments, or even the simple injection of cold water, do great good. The compound gall ointment is a favourite application. If the piles protrude, the nitrate of mercury ointment may be employed. If they become very large and troublesome, they had better be removed, the mode of effecting which can hardly be discussed here.

COLIC.

By colic is nowadays meant an abdominal pain of a severe twisting character, not fixed in site, but wandering about over the abdomen, though usually most severe in the neighbourhood of the umbilicus. This pain is neither due to inflammation, nor to alteration in the tissues of the intestine, being in its nature strictly nervous. Very often the pain is accompanied by flatulence, the wind moving hither and thither in the intestine with a rumbling noise. Colic is most frequent in young people, and more common in women than in men. The most usual cause of an attack is the presence of indigestible food in the bowels, which giving rise to fermentation, produces gases which distend the gut and so give rise to the pain. For some reason cold feet seem to have a powerful influence in bringing on colicky pain, but this appears to be due to irregular and inordinate movements in the bowels themselves, and therefore differs in certain respects from flatulent colic. Sometimes the pain in the bowel is associated with bilious vomiting, but this rather constitutes an attack of acute gastric and intestinal catarrh, than pure nervous colic, though going by that name. Differing in certain respects from the above, yet resembling it in the kind and region of the pain, is mesenteric neuralgia. The pain is the same in kind and occupies a like situation; it too comes and goes in gusts; in it too the patient is restless and seeks relief by moving about and compressing the abdomen; its mechanism is even less understood than that of ordinary colic. When colic occurs, the pain is neither continuous nor fixed in one place; it comes and goes, its

phases of aggravation being severe enough to make the patient cry out. He cannot rest, but is ever seeking ease in a fresh posture, that which gives most relief being flat on the face with the hands pressing against the belly. The abdomen itself is tense, but is rather drawn inwards than puffed outwards. The face is pale and pinched, the hands and feet cold and wet, the pulse hardly perceptible. There is very often a feeling of desire to go to stool whilst the bowels are confined and obstinate, but frequently when they are moved the pain disappears like magic. In the more distinctly flatulent kind the same results may follow the movement and discharge of flatus. The period during which colic lasts is very variable, most frequently a few minutes or hours, sometimes even days; but when the latter is the case, we should suspect something more than a mere colic. When it has lasted some time it is apt to leave a feeling of pain or tenderness behind it, but in most cases it ceases as abruptly as it comes on. The so-called lead colic has been elsewhere described.

Treatment.—As in most cases colic is due to imprisoned flatus or fæces, the first thing is to get the bowels to move, and, as the patient is hardly in a humour to wait long, we should give a speedily-acting warm purgative. Castor-oil with a few drops of some aromatic oil, or a black draught with plenty of essence of ginger in it, are the best remedies, whilst warmth to the bowels (or even a mustard plaster) tends to give relief if the pain be severe. Rubbing with warm flannel and turpentine is very grateful if the colic be flatulent; sometimes even a turpentine stupe is necessary. Where we have no reason to suspect derangement of the bowels, we may give what are called carminatives—as peppermint, ginger, and cloves, of which we have various preparations, as ginger-brandy, essence of cloves and peppermint, as well as a liqueur made of caraway, called kümmel. Opium is hardly necessary. If really needed, from five to ten drops of laudanum may be given in a little hot brandy-and-water, or a somewhat fuller dose of the compound tincture of camphor may be administered in the same way. When, however, the malady is more distinctly neuralgic, and is recurrent, fuller doses of opium may be used, or morphia may be injected below the skin. In all other cases, whatever we use, we should not neglect the use of laxative or purgative medicines; for in by far the greater majority of cases some indigestible article is at the root of the mischief, which will recur until that is removed.

DISEASES OF THE PERITONEUM.

PERITONITIS.

Inasmuch as the peritoneum covers the stomach and bowels, as well as all other abdominal organs, we have been compelled incidentally to notice various lesions to which it is liable, in connexion with these, the most important being peritonitis. That, however, is so important a malady that we must deal with it in a separate chapter, for in truth it is among the most serious of diseases. The tendency to peritonitis in healthy individuals is not very great, and even in the less robust the peritoneum may be seriously injured without any inflammatory mischief being excited; but in certain morbid states, especially in Bright's disease and tuberculosis, the liability is very greatly increased.

Attacks of peritonitis are sometimes said to occur from exposure to cold, but such must be rare, except some latent tendency to the mischief already exists. Sometimes peritonitis is only part of a more general malady, as in some forms of pyæmia, and the malady called puerperal fever. In this connexion, however, we deal with the peritonitis which is a local, rather than a general, affection. Among the causes of peritonitis we must include wounds of the abdomen, especially of the penetrating kind, as well as contusions which lead to an escape of blood into the cavity. Blood may, however, remain a long time in the peritoneal cavity without setting up inflammation. More certain causes are such lesions as give rise to extravasation of the contents of any of the organs enrolled in the peritoneum, as perforating ulcer of the stomach and bowel, ulceration of the cæcum or vermiform body, foreign bodies there arrested, the opening of abscesses, or from extension of cancerous growths to the surface of the peritoneum, with or without perforation. Typhoid ulcers of the bowel are prone to end in this way. Another way in which peritonitis arises is by the spread of inflammation from the organs contained in the abdomen to their serous covering. In this way enteritis from poisonous substances often gives rise to peritonitis; typhlitis, too, generally extends to the peritoneum, where the cæcum is covered by it. Still more frequently does inflammation extend from the uterus and its connexions to Douglas's pouch, and thence it may be to the peritoneum generally. In yet other forms of mischief

as internal strangulation and invagination of the bowel, as well as in ordinary strangulated hernia, peritonitis is an invariable accompaniment.

The indications of peritonitis vary according as the disease is *acute* or *chronic*, *general* or *partial*—by far the most important form of the disease being that which is both acute and general. Sometimes the *pain*, which is usually a marked symptom of peritonitis, begins at one particular spot (especially if there has been any injury at that point), and in some cases spreads with great rapidity. Perhaps the form in which this is most striking is where perforation has occurred, whether from typhoid or tubercular ulcer, and the contents of the gut have escaped. Where the mischief spreads from an inflamed organ this is far less striking, though very marked when associated with strangulation. Rigors in such severe cases have no time to occur; there is instead more or less complete collapse. In most cases the pain is severe and tenderness excessive; every movement is dreaded—even a footstep which may shake the bed excites apprehension. The weight of the bedclothes can hardly be borne. The patient keeps absolutely quiet, and will suffer much inconvenience rather than by moving the muscles of the abdomen increase his agony. He lies most frequently on his back, with his knees drawn up to relax the abdominal muscles and prevent pressure on the abdomen. He hardly breathes, and does not speak above a whisper, so as to keep the diaphragm as still as possible, whilst anything like a cough is dreaded and earnestly shunned. Soon the abdomen begins to puff up, from what reason is not clear, but probably in part at least due to relaxation and paralysis of the muscular coat of the intestine allowing what gases are contained within it to expand to the uttermost; but this clearly is not all, and it has been supposed that there is a special secretion of gas, which is very unlikely. At this stage, therefore, the abdomen is tympanitic if we venture to percuss it, but soon exudation comes to take its place as one of the distending agents, the two together giving rise to grave discomfort. They sometimes press upon the diaphragm and prevent its moving; they sometimes also, in pushing it upward, interfere with the use of the lower lobes of the lungs, so that there is diminished capacity for breathing. Partly for this reason, partly because the breathing is intentionally shallow on the part of the patient as thereby giving least pain, the respirations are greatly increased—as many as forty or more per minute.

The action of the heart, too, is interfered with directly and indirectly—directly by the pressure, indirectly by the influence of the inflammation or its products on the cœliac plexus. Hence we have a small, quick pulse, always over a hundred, sometimes more; and the temperature is high, even 105° Fahr. With this the bowels are obstinately confined, save in the puerperal variety of the malady, this being due to paralysis of the muscular coat of the intestine, the purging in the latter case to increased discharge of fluid into the gut. Vomiting frequently occurs, but is not an invariable symptom, the vomited matters being green and bilious. As time goes on, the distension of the abdomen increases, greatly increasing the patient's misery; and this distension is now mainly due to effused fluid, not to tympanites, though that may persist in certain spots, especially near the umbilicus. The patient, whose mind is painfully acute, is a prey to the keenest anxiety; he prays for relief, which we are too often unable to give him. But this does not last; prostration speedily follows, hiccup comes on, the vomited matters are brought up in gulps, and are often grumous in character. The pain goes, but the pulse falls till it fails to be perceptible, and the patient, imagining himself on the highway to recovery, suddenly sinks in from four to six days after the onset of the mischief.

Such is acute peritonitis as we commonly see it, but there is another, and more insidious form which is equally fatal, and especially apt to deceive the inexperienced and unwary. After, let us say, an operation for ascites, the patient may feel remarkably well, and may seem on the high road to recovery, till we find the abdomen beginning to swell. It is somewhat tympanitic, and the fluid seems to have regathered; by-and-by the distension increases, and the patient begins to complain of discomfort, but not of actual pain. There may be slight tenderness near the site of operation, but this is by no means a marked symptom. Altogether we should fancy there was nothing greatly amiss with the patient, were it not for his quick pulse and elevated temperature at night. There is some anxiety in his look, but very likely he will persist in saying he feels nothing uncomfortable, except some difficulty of breathing, and feeling of distension. But his tongue gets dry and cracked, anything he takes he vomits, and while all seems going fairly well, he suddenly, to the surprise of those about him, becomes delirious and col-

lapsed, and he dies, his pulse and breathing having been for some time hardly perceptible. All through the illness there is little or no complaint of pain or tenderness, no drawing up of the legs—in short, nothing of what are commonly considered the chief indications of peritonitis.

After death from peritonitis we find no longer the diffused reddened appearance seen at the very beginning of the disorder, even before the peritoneum has had time to lose its smooth look and to put on a velvety appearance; but instead, an abundant fluid exudation, somewhat turbid or milky-looking, in which float thin flakes of whitish material, the origin of which becomes more apparent when we proceed to examine the intestines and walls of the abdomen. This fluid is sometimes so abundant as to escape freely when the abdomen is opened; at other times it exists only in small quantities, and the inflammatory products put on an appearance as if the intestines had been smeared with white or yellowish paint. In all cases, if we want to make ourselves aware of the exact quantity of fluid, we must examine the cavity of the pelvis, for even in cases where inflammation does not originate there, the fluid tends to gravitate to this, the lowest spot in the abdominal cavity. In some cases no fluid effusion is observed, and only a thin, semi-transparent layer of fibrinous material is found on the bowel and abdominal wall, sometimes assuming a thicker appearance towards the backbone. In all cases this effusion, or new formation, conceals the peritoneum beneath it. We most frequently find the scanty effusion where there has been some comparatively slight local cause setting up the mischief, or where the mischief has spread from neighbouring organs, or been excited by cancer; the more abundant effusion indicates a more severe form of the malady. Sometimes we find a form between the two, where the new material is not very abundant, but is more than semi-purulent. Such we sometimes see in Douglas's pouch, when the inflammation has spread from the uterus.

But though peritonitis is a most fatal complaint, all patients do not die at this stage. If not, the effusion begins to be absorbed, but not very rapidly; the pain lessens, the tenderness diminishes, the distension is not so great, but never goes away entirely. So, too, the pulse and temperature fall, but not to the normal standard. If the fluid is reabsorbed, the solid exudation is not; it remains, and, as the fluid disappears,

becomes more and more distinct, forming nodules, encapsulating fluid, and binding the bowels together in irregular masses, which can be felt through the walls of the abdomen, now become unnaturally thin. The bowels are moved, but irregularly, and the fever tends to assume a hectic character; too often, even in this stage, the individual's strength fails, and he sinks exhausted. Here the post-mortem appearances differ: there is little fluid, for the absorption of it has left the new formed elements in a consistence which resembles pus, and is in fact pus to all intents and purposes. These purulent masses are enclosed in newly-formed tissue, which binds together the bowels, and is of greater or less density, according to its standing, so that in separating the bowels we are continually opening nests of this semi-fluid material. Still later in the history of the malady the semi-fluid matter may become cheesy in some parts, soft in others, the whole enclosed in a new-formed connective tissue. In yet other cases we may see the copious new cell-formation eroding the peritoneum, and making its way, like other purulent deposits, towards the surface, or escaping by the intestines, bladder, or abdominal walls. The signs of this last accident during life are increased hectic character in the fever, or œdema and reddening at some spot in the abdominal walls, which soon give way there, and a collection of pus is evacuated. But this is only one of many such collections, and the symptoms suffer no abatement. Such patients sooner or later die exhausted. Even when in acute general peritonitis the patient does make a good recovery, the subsequent mischief and suffering from binding down the bowels, gluing them together, and so interfering with their movements, is very great. This has already been referred to as one of the forms of obstruction to which the bowels are liable.

Acute *partial* peritonitis is a much more common and more manageable disease than the more general form. It arises from some localized irritation sufficient to set up peritonitis, but which from some constitutional or other causes does not tend to spread. Most frequently inflammation of some neighbouring organ invades the peritoneum, and is indicated as usual by great pain extending all over the abdomen, but the tenderness is limited more distinctly to one spot. There is no great abdominal distension, the bowels are not so obstinately confined, and there is no vomiting; moreover, the fever is not so great. The acute

symptoms do not last long, especially under treatment, but rapidly subside, leaving permanent adhesion at the spot where the inflammation has taken place. Such is the form which is apt to occur in slow perforation of any abdominal organ, as in ulcer of the stomach, strumous ulcers of the bowels, or in typhlitis, and perforation of the vermiform appendix. Ulceration proceeding more rapidly, and resulting in extravasation, gives rise to the more general form of the mischief. In certain cases, especially where there is much exudation, even the localized peritonitis does not run such a favourable course, but forms encapsulated collections of matter, which tend to perforate surrounding organs, and so create false passages. Many attacks of partial peritonitis must, however, be subacute, and give rise to, comparatively speaking, no signs, since we frequently come across adhesions in the abdomen, just as we do in the pleura and pericardium, of which during life no history was obtainable.

Chronic peritonitis is the form most frequently associated with strumous disease of the mesenteric glands, hereafter described, and so most common in youth. These patients suffer from irregular attacks of pain, and alternating diarrhœa and constipation, going to stool being always painful from the motion of the abdominal muscles; moreover, they undergo gradually increasing emaciation and show some degree of fever, particularly at night. The abdomen when examined is puffed and exceedingly tender; its shape is inclined to be spherical, but sometimes drawn in by contracting new formations, and if we percuss, we find it tympanitic at one point, dull at another from encapsulated effusion, whilst knots or lumps can be felt through the thin abdominal walls. Rarely do we find absolute dulness from such an effusion. Death comes sooner or later from hectic and exhaustion or from interference with nutrition. In attempting to make a post-mortem examination in such cases we may find it impossible to open the abdominal cavity, for none is left; if we cut through its walls, we cut at once into the gut, the whole mass of intestines being sometimes bound together, or we may have masses of encapsulated pus here and there, all over the abdomen.

Treatment.—Whenever we can make out the cause of the peritonitis, and we can remove it, it is our duty to do so at once, but this is not often the case. We have, however, a good example of the benefits arising from this

practice in strangulated hernia, where the hernia can be reached by operation. If we cannot do so, we must endeavour to avert the evil effects of inflammation, and for so doing, by universal consent, there is no remedy like opium. But opium must be given with no slack hand, and if it cannot be retained, if given by the mouth, let it be given by the rectum or subcutaneously. Here, as in some other cases, it is always best to give the opium in repeated doses, so as to keep the patient fully under its influence. And it is the physiological effects rather than any specific rule as to dose which must govern us in our efforts to benefit the patient. A common dose is, however, from half a grain to a grain of crude opium in pill every hour, till the eyes begin to show its effects by contraction of the pupils. But here we are met by a danger: the pills may not dissolve in the stomach, but accumulate there, and subsequently when they begin to dissolve, signs of narcotism may manifest themselves. This cannot happen if the morphia is given subcutaneously, and so that is the better way of administering it. We may begin with half a grain, to be followed by a dose of a quarter of a grain every three or four hours. In olden times the treatment of peritonitis was easy enough. Calomel and opium, or calomel without the opium, and bleeding again and again from the arm, was the regular routine treatment, which, we need hardly say, was not very successful. Nowadays we have stopped all of this save the opium, and on the whole benefited by the omission. How far, however, the use of local bleeding should be passed by, is a question; undoubtedly leeching does relieve the pain of peritonitis, especially of the localized kind, and there it is no doubt of great service, but we question its virtue in the diffused complaint.

After bleeding, we must consider the value of other local appliances. In some cases cold is well borne, in others it is not. If cold can be borne, it should undoubtedly be employed, but with judgment; the inflamed abdomen will not bear the weight of heavy compresses—a double fold of flannel is all that can well be sustained. Such a compress should therefore be applied, wrung out of water in which ice is kept melting, that is at a temperature of 32° F., and changed repeatedly, but as softly as possible. If warmth is better borne, we must use the same material for its application; even a light poultice may be unbearable. If, however, we do make use of warm applications, it is on the whole as well to combine with

them the use of turpentine. The folded flannel is to be wrung out of water as hot as the hands can bear; oil of turpentine sprinkled freely over one side, and that side of it promptly applied to the bowels. This too should be repeated frequently. By both of these means pain may be diminished, though the inflammation may be not seriously controlled; nevertheless freedom from pain is a great thing, for in peritonitis it is very severe and very exhausting. Whether cold be used externally or not, we should not neglect the use of ice internally, for that is of supreme value in allaying irritability of the stomach. It is best given either by itself or along with small quantities of champagne. If the stomach is very irritable, we must not try to give much food, lest we defeat our own object. What is given should be concentrated, small in quantity, and quite cold.

If later in the disease, especially of the localized kind, we find fluctuation, the abscess had better be opened as early as possible; and even if no fluctuation can be made out, but only limited dulness and hardness, we had better employ poultices freely. If we have any reason to think that they can be removed by absorption, then painting with iodine is the best resource. In any case where the malady tends to become chronic, cod-liver oil and iron should be employed freely. One word more as regards the tympanites: that is a most dangerous, distressing, and most intractable symptom; if necessary we should not hesitate to evacuate the gases by a very fine trocar, such as is used in aspiration.

CANCER OF THE PERITONEUM.

Cancer of the peritoneum is not, relatively speaking, a very rare malady. Most frequently it is secondary to malignant disease elsewhere, or in one of the organs covered by the peritoneum; but it may occur as a primary affection. The organs so affected are chiefly the liver, stomach, and female sexual organs. Both scirrhus and medullary disease occur. Colloid is rarer. Scirrhus occurs in small flat nodules, which tend to run together and form diffuse flattened masses, level with the peritoneum and sometimes quite uniform. The folds of the peritoneum and appendices epiploicæ are generally involved, and tend to contract and harden. In other parts too the growth tends to diffuse itself over the membrane, but never to form thick deposits. The masses of medul-

lary cancer are softer and more prominent, sometimes even pedunculated; but again, it may affect the thickness of the mesentery, forming a mass of cancer or knots and excrescences—sometimes of considerable size. Colloid begins as weals or groups of gelatinous vesicles, the patches becoming elevated above the surface, and the subperitoneal tissue is involved. Sometimes it extends deeper, and involves the substance of the organs covered by the membrane. Often the omentum is converted into a lobulated mass of disease, distinctly gelatinous when cut into. This glairy fluid is sometimes discharged into the abdomen.

The symptoms of peritoneal cancer are far from being characteristic—in point of fact, they resolve themselves into those of chronic peritonitis; but here obstruction and consequently persistent constipation are more likely to occur. Moreover, cancer of the peritoneum seldom exists singly; either the liver, stomach, or some other organ is also as a rule affected. Hence the existence of a tumour in the abdomen with similar tumours in one or other of the abdominal organs or with known cancer elsewhere, will point certainly to cancerous disease of the peritoneum, if we have also the signs of a chronic peritonitis. In many cases the diagnosis is latterly increased in difficulty by the existence of ascites, but even then the discovery of the thickened omentum as a hard bar across the upper part of the abdomen may enable us to form a correct diagnosis.

The *treatment* of peritoneal cancer resolves itself into the treatment of symptoms, to support the patient and keep his pain quiet, in which of course opium is the prime auxiliary. Little attacks of peritonitis, which are apt to occur from time to time, are best treated locally by counter-irritation and by morphia.

SCROFULOUS DISEASE OF THE MESENTERIC GLANDS AND PERITONEUM.

Tubercle of the mesenteric glands is seldom disassociated from symptoms of the same complaint elsewhere. What, however, we call scrofulous disease—and which may exist in the mesenteric glands without indications of the mischief elsewhere—is commonly found in children, and is very probably connected with the state of chronic intestinal catarrh to which they are so prone. In

ordinary intestinal catarrh, Peyer's patches become enlarged and swollen, the swelling subsiding as the irritation departs; but if it persists, this enlargement indicates a whole series of changes. The lymphoid elements of the glands increase in number till they choke each other, they become granular, degenerate, and are finally converted into cheesy masses. The mesenteric glands, which are in direct communication with these glands, undergo like changes; but here the similitude tends to cease: the cheesy intestinal glands soften, break down, and are washed away piecemeal, leaving an ulcer behind. Very rarely indeed this ulcer continues to perforate deeper and deeper, till perhaps the bowel is pierced and peritonitis ensues. In the mesenteric glands softening and rupture are very much rarer, the cheesy mass rather tends to dry up and to become cretified. If only a few glands have been so affected, nutrition is carried on as usual, and in time the patient does perfectly well; but in other cases where the glandular obstruction is extensive, nutrition is sadly interfered with, the patient falls away to skin and bone, the skin hanging like a loose sack about him. Such a train of changes is most prone to occur in children, and constitutes in them what used to be called *tabes mesenterica*. Through this loose skin and thin abdominal walls the knotted mesenteric glands are usually but not always discoverable, and not very difficult of diagnosis. This condition of the mesenteric glands often gives rise to peritonitis of the chronic kind already alluded to. Occasionally we have more general tuberculosis of the peritoneum—seldom, however, by itself alone, but generally associated with tubercle elsewhere. These tubercles may be miliary granules, but more frequently are larger, and more distinctly tending to fatty degeneration. In either case, the peritoneum is commonly covered with lymph, and there is some effusion of fluid into the abdominal cavity, giving rise to a true ascites. When the peritoneal tubercle is general, as in acute tuberculosis, the symptoms occasioned by it are these—loss of flesh, fever (especially at night), quick pulse, and wandering pains; the abdomen becomes hard and tender, with some pain; the tongue is furred; there is thirst, sickness, and loss of appetite, with alternating constipation and looseness of the bowels. The fever seems to eat the patient away, and he dies in what is called a typhoid condition. In the other form the abdominal signs are much more marked·

there is more or less peritonitis of a subacute or chronic character, with copious effusion of fluid. This differs from ordinary ascites in that the belly is very tender on sharp pressure. Still, in both forms there is a tendency to the formation of tubercular deposits elsewhere, and these will probably guide us to a right conclusion as to the nature of the malady.

Treatment.—The treatment of this form of disease resolves itself into the treatment of the general condition and of the particular symptoms; promptly to arrest the irritation of the bowels, which tends to set up proliferation in the lymphatics of the intestine and mesentery, and to keep up nutrition. In the first place, therefore, we must deal with the intestinal catarrh, and next with the enlarged glands. For the enlarged glands we must apply iodine externally, painting the abdomen freely with it; and this too is the best treatment, even when peritonitis has shown itself. We must change the food, and make it as nutritious as possible, and give plenty of cod-liver oil, with the syrup of the iodide of iron, or the syrup of the phosphates. Often this will not suffice, and then it is wonderful what good can be done by rubbing any kind of oil, but particularly cod-liver oil into the skin. This will often make a most marvellous difference to a puny child, and enable it to get over the dangerous period with much fewer enlarged glands than could have been expected.

ASCITES.

By ascites we mean an accumulation of fluid in the peritoneum, whether this be a part of a more general dropsical condition or be strictly localized. Thus ascites may be due to general retardation of the blood current, as in disease of the heart and lungs, interfering with circulation. Accordingly it may occur in emphysema, with chronic bronchitis, and in enlargement of the right side of the heart from whatever cause. It sometimes also occurs in the later stages of phthisis, partly from obstruction, partly from weakened propelling power. Ascites may also be due to Bright's disease, of the kind which interferes with the free elimination of fluid from the system, or again in its later phases, when hydræmia has become a marked symptom. In all these there is effusion elsewhere as well as in the peritoneum. But the cause of ascites may be more distinctly localized, and then the patient is devoid of any

general dropsical combination; such is the case when it is due to portal obstruction, especially in the liver itself, as occurs in cirrhosis, and sometimes in cancer of the liver. Lastly, as we have seen, ascites may be due to peritonitis, acute or chronic; if chronic, especially to that form caused by colloid cancer, scrofulous or tubercular glands, or by tubercle of the substance of the peritoneum.

The symptoms of ascites, if the fluid be at all abundant, are characteristic enough. The abdomen is enlarged at first only slightly, so that the patient merely complains of over-fulness, and unlooses his clothes; but as it increases other difficulties supervene. The fluid presses up the diaphragm, and compresses the lungs; hence there is difficulty of breathing, especially on exertion. Moreover, the weight of the fluid causes the patient to walk with his back bent backwards and legs apart, like a pregnant woman. The fluid presses on the bowels, and interferes with their due action, or if the pressure be great, it acts even on the renal veins, causing renal congestion, diminished quantity of urine, and albuminuria. Pressure on the inferior cava and iliac veins too causes obstruction in them, and so we have œdema of the lower extremities. But in both the renal mischief and the œdema of the lower extremities, we have a history of tightness and discomfort in the abdomen long before either symptom was manifest.

When the patient is placed in bed, on his back, to be examined, we find the abdomen large and rounded, tending to spread out in the flanks, and the skin is sometimes tense and smooth. The greater part of the abdomen is quite dull on percussion, especially in the flanks; but over the highest spot, generally near the umbilicus, we usually bring out a tympanitic note; this is due to the intestines containing gas and floating on the fluid, so that they change their position with every change of the position of the body, still keeping to the highest point. When the abdomen is very tense, the navel protrudes, the surface is covered with blue veins, and there are white or bluish striæ here and there as in pregnancy. If now we tap the abdomen with the points of the fingers, placing the palm of the other hand on its surface some little way off, we cause the fluid to vibrate, and this peculiar thrill or vibration is propagated to the hand at a distance. This is not, however, always easily made out, especially if the quantity of fluid be small, but we can generally manage to elicit it by making the patient rest on his hands and

knees, so that the front of the abdomen is its most dependent part. The history of the mode of growth is important, especially in women, in whom there is always a risk of confounding ascites with ovarian dropsy, but the latter begins always at one side, does not alter in position by changing the position of the patient, and does not attain to the character of ascites until late in its history, and then only when it is unilocular. Ovarian dropsy begins at one side, and so the swelling is rarely if ever quite symmetrical. It is important to be able to make out whether the ascites, if simple, is due to inflammation of the peritoneum, or to obstruction; if the latter, its site is most probably in the liver, and in the majority of cases is cirrhosis. We are therefore anxious to make out whether the liver is smaller than usual, or no. But here we are met by a difficulty of some importance. The liver is not, like the intestines, a hollow organ, and as they commonly are in the malady, filled with gas, but solid and heavy. Accordingly, when the patient lies on his back with the lower ribs separated by the fluid as far as possible, the liver no longer touches the side at the edge, but falls away from the margin of the ribs, and may even have a piece of inflated intestine interposed. This fact must ever be borne in mind in framing an accurate diagnosis.

Treatment.—The treatment of ascites must vary with its cause. When part of a general condition we must deal with that rather than the ascites. Especially is this the case in heart and lung disease. When, however, the ascites is accompanied by or due to marked hydræmia, it is better to treat it with tonics than with the routine purgatives. When we cannot treat the general condition successfully we must try to do our best for its local manifestation in removing the fluid. Various plans are suggested, and all may be tried. First and simplest, though unreliable, as the skin is usually dry and hard, we may try the effects of perspiration, which, though a hopeless expedient for removing the dropsy completely, still promises something in the way of relief—may, as it were, break the neck of the disease, after which other remedies may come in to effect the cure. If this be desired a very good plan is to wrap the patient in a sheet wrung out of tepid water, put him in a blanket, surround him with hot bottles or hot bricks, and cover him well with the bedclothes, till a good perspiration has broken out. Most practitioners prescribe drastic purgatives, such as compound powder of jalap,

compound powder of scammony, and the like; but we confess we have often seen but little good follow their use, whilst if too long continued they set up irritation of the bowel, superadding a new mischief to the old one. By all means let them be well tried, first one and then another, but if they do not soon prove beneficial let them be promptly discarded. Better use such hydragogues as do not irritate the bowel, especially simple salines, in good full doses. These are much more likely to do good than gamboge and the like. Most men decry diuretics, yet we have seen what are commonly called diuretics do good service. The old pill of digitalis, squill, and blue pill certainly often clears the abdomen, with an increase in the quantity of urine passed, whether we call it a diuretic or no. So the electuary of cream of tartar, or cream of tartar as an habitual drink, often does great good in removing the fluid.

Sooner or later, however, we are brought face to face with the necessity of tapping. When due to heart or lung mischief or to kidney mischief, and ascites is part of a general disorder, this is useless. Usually paracentesis abdominis is postponed as long as possible, whether rightly or wrongly we shall not here determine. We are not among those who hold it an operation without risk, for too often we have seen peritonitis follow, but skilfully performed we have also seen it followed by complete recovery. Very likely, indeed, there will be a partial return of fluid as soon as the emptying of the abdominal cavity has relieved pressure on the veins;—for sometimes the quantity removed amounts to a good many gallons, usually of a greenish-yellow fluid. But even if the fluid does partially reaccumulate, we are in a better position to deal with it in another fashion, for when the abdomen is enormously swollen remedies seem to do little or no good, whereas after tapping they succeed most wonderfully. Tapping is usually performed by a large trocar, and is apt to be followed by faintness, if the fluid be withdrawn too rapidly. Many of the objections to its use are obviated by the use of a much smaller trocar, and more patience in the removal of the fluid.

DISEASES OF THE LIVER AND BILE-DUCTS.

HYPERÆMIA AND CONGESTION OF LIVER.

By hyperæmia we mean increased influx of blood into the liver, by congestion its diminished egress. Hence the causes of the two are different, as are also their consequences. As the liver has a double source of blood supply, the sources of hyperæmia are twofold—from the portal vein and the hepatic artery; but the former far outweighs the latter in importance. The quantity of blood in the liver varies very considerably within certain limits at different times. All glands are more plentifully supplied with blood during the period of their greatest activity, but this also corresponds, in the case of the liver, with the period of digestion, during which the matters absorbed by the portal vein are being rapidly conveyed into the general blood current. There is no doubt that this normal congestion may be greatly increased by the use of food and drink readily taken up in excessive quantity by the portal vein, such as what we commonly call rich food, and fermented and spirituous liquors, especially if systematically used in excess. By such means the capillaries get over-strained and permanently dilated. Another cause of hyperæmia, however, we know lies in what is called malaria. How this acts we can hardly say—perhaps by dilating the capillaries of internal organs, especially the spleen and liver; but at all events, hyperæmia of the liver is a well-known consequence of exposure to malarial influence. Chills are also causes of hepatic congestion. Congestion may also usually occur in valvular or other disease of the heart tending to dilatation of the right side, from obstructive disease of the lungs—as emphysema, chronic bronchitis,—or even from such a thing as aneurism of the aorta pressing on and obstructing the pulmonary artery. The enlargement of the liver produced in these various ways is rarely very great, and it is uniform, though there is perhaps greater increase in thickness than in length; the serous coat covering it is tense, smooth, and glistening. When the organ is cut into, the blood comes away freely, but perhaps less so after the congestion has lasted some time. It then tends to undergo the changes common to all organs habitually overfilled with blood—*i.e.*, of hardening from increase of its connec-

tive tissue. The cut surface is sometimes uniform, but in cases of long standing some parts are much deeper tinted than others. The central veins of the lobules being in direct communication with the hepatic vein and heart, are in obstructive disease engorged, and so they seem darker than do the less-filled portal veins. If these last be accompanied by distended bile-ducts, this gives a yellowish appearance to the brighter-coloured spaces. This appearance is that designated nutmeg-liver, and is characteristic of the obstructed condition of the hepatic veins. The subsequent history of such a liver is that of all organs under like circumstances—it may diminish in size, whilst it increases in density; at all events the parenchyma wastes as the connective tissue grows. This is the atrophic form or stage of nutmeg-liver, and not to be confounded with cirrhosis.

The symptoms of a congested liver are in part due to the increased weight of the organ. There is a feeling of fulness and heaviness in the region of the liver, which aggravates considerably the troubles of the patient suffering from heart disease. There is also some tenderness, rarely very great, about or just below the margin of the ribs, and the pain in the same spot may be considerable, extending thence upwards to the right shoulder. This is in some cases aggravated by dragging to the left side, if the patient lie on that; but the reverse is often seen, so that lying on the right side is impossible, from the pain produced by pressure on that side.

Jaundice commonly occurs, but not to any great extent. It is due either to pressure on the bile-ducts by the congested radicles of the portal vein, or to some degree of catarrh of the bile-ducts themselves, for the causes which give rise to congestion of the liver give rise to something of the same kind in the bowel, and the consequent catarrh may spread to the bile-ducts. The jaundice is not, however, very severe, for the ducts are rarely completely closed. There are also signs of gastric and intestinal disturbance, such as have been alluded to as caused by congestion of these organs. Examination of the side shows perhaps some visible enlargement of it, whilst palpation and percussion show more unmistakeably that the liver reaches lower than the ribs by an inch to an inch and a half or more. The edge of the liver, when it can be made out, is everywhere smooth; but sometimes it cannot be defined, and then the beginner is apt to mistake

the rigid rectus (contracted to protect the tender liver) for the edge of that organ. Displacement too of the organ, such as occurs from pleurisy of the right side, must not be mistaken for signs of enlargement. In females too we must bear in mind that tight lacing tends to deformity of the liver, elongating it downwards, and producing a well-marked constriction in its middle. In such cases the liver may reach the umbilicus from no other cause. Be that as it may, the congested liver does not remain permanently enlarged, but sooner or later begins to diminish, though a subsequent attack may again cause it to enlarge. Such is especially the case abroad in warm climates. When this occurs in combination with heart disease, the dropsy which comes on is mainly or in excess ascitic, and this is an important diagnostic mark of the condition of the liver; but, as already pointed out, we must be careful in ascites in diagnosing diminution in the size of the liver. The urine, we ought to say, in congestion of the liver tends to be scanty, highly concentrated, and to deposit lithates.

Treatment.—First of all, if the congestion depend on over-fulness of diet, set the patient on a simpler one, and substitute active habits for lazy ones. Even this by itself will usually suffice to bring back the liver to its normal condition. If not, it may be aided by saline purgatives, natural mineral waters, those of Homburg and Marienbad being the best; but if necessity compels these to be taken at home, we should prefer Püllna or Friedrichshall. If there be much pain, a few leeches will relieve it; but as the pain is not very acute, the patient can usually wait perfectly well for the action of more general remedies. One very frequent cause of hepatic congestion in this country is over-consumption of beer where enough exercise is not taken to use it up; such cases are more common than hyperæmia from high living or strong drink of a different class. Often when the more acute symptoms have passed away, the patient does not recover, but remains a sufferer from habitual indigestion and a prey to hypochondriasis. When that is the case, alkaline and saline mineral waters often do great good, especially if followed up by those containing iron. If repeated congestion has arisen from exposure to tropical malaria, a change of climate becomes necessary, or permanent enlargement may result. In these cases quinine should be freely given, and if the organ continue enlarged the oint-

ment of the scarlet iodide of mercury should be well rubbed in before the fire, as is sometimes done with great advantage in enlarged spleen from a similar cause.

SUPPURATIVE INFLAMMATION OF THE LIVER.

Inflammation of the liver ending in abscess is not very common in this country, though common enough in tropical climates. There it is very frequently associated with dysentery, insomuch that the two have been looked upon as cause and effect. Nowadays we are inclined to look upon the combination as accidental, or at all events that the two are in many cases the outcome of the same active influence—most frequently that which we term malaria. There is, however, in this country a form of hepatic abscess by no means uncommon, which has a totally different etiology; it is that resulting from pyæmia. The liver is indeed one of the most favourite sites of such secondary pyæmic deposit, but the characters of the abscess of pyæmia and that originating in tropical countries are very different.

In *tropical abscess* the symptoms come on much as they do in congestion of the liver, only they go farther. There is fulness and pain in the right side, and on that side the patient cannot lie, on account of its tenderness; there is fever and loss of appetite, with pain in the right shoulder. First, as regards the fulness. This of course is due to enlargement of the liver, but even slight enlargement is not a constant phenomenon. When it does occur, however, it tends to be unsymmetrical, especially if the abscess comes near the surface and bulges there. This bulging is rounded and smooth, not irregular, and in many cases we can readily detect in it the fluid of the abscess, especially when the abdominal walls have thinned. If the abscess tends to point towards the chest, there is sharp pain in the region of the diaphragm, and before long signs that the lung is implicated. Chills are of frequent occurrence, and are followed by flushes of heat or perspiration, but neither is invariably present. Though the liver is not a very sensitive organ, and much mischief may be done in it without any sensation of pain, yet when the abscess approaches the surface, or if the peritoneal covering and capsule of Glisson are stretched early in the disease, the pain is severe from the

first. The pain in the shoulder is not invariably present. Tenderness over the liver varies as does the pain, being ever greatest when the abscess is near the surface; sometimes it is only elicited by pressing upwards beneath the ribs, whilst the patient pushes down his liver by taking a long breath. It is one of the peculiarities of abscess of the liver that it need not greatly raise the pulse; but this, like all other symptoms, is promptly aggravated by an implication of the superficial coverings. In all cases there is a rise of temperature to the extent of one or two degrees or more. The digestive organs are not greatly out of order except the abscess tend to point towards them, and the same may be said of those of respiration. The urine in the acute stage is scanty, full of pigment, and copiously deposits coloured lithates. Jaundice is very rare, save in the first stage, and then it is very slight, being occasioned by pressure of the distended hepatic artery on the bile-ducts—a comparatively slight compressing force compared with that of the portal vein. From accidental compression of the portal vein we may have ascites and enlargement of the veins in the walls of the abdomen; but this is very rare. One important fact serves us as an aid to diagnosis—that such abscess of the liver is very rare, in those who have never lived abroad, and except from impacted gall-stone or injury hardly ever happens in this country.

The abscess of the liver we see in this country is sometimes, it is true, due to direct injury to the substance of the organ, but is more frequently metastatic. Even for tropical abscess, a purely metastatic or pyæmic origin has been assigned. No one can help being struck with the frequency with which abscess of the liver and dysentery are associated, and it is difficult to avoid the conclusion that they are somehow closely connected. The idea, strongly urged by some observers, and doubtless sometimes true, is to the effect that particles of sloughing and disorganized tissue are absorbed by the vessels of the diseased colon and thence conveyed to the liver. Being there arrested, in the capillaries of the portal vein, they set up fresh mischief in that organ, which ends in the formation of abscess. It is sufficient contradiction to this exclusive theory, that cases of abscess of the liver have proved fatal where no trace of dysentery was to be found. In purely *pyæmic abscess* the enlargement of the liver is rarely very great, and as the abscesses formed are diffused

throughout its substance instead of constituting one large collection of matter, there is no indication of bulging; though very rarely, if many abscesses form in the lower margin of the liver, a nodulated character may be given to it which can be detected through the walls of the abdomen. For the same reason there is rarely fluctuation, and still more rarely ascites; but there are always pain and tenderness, and in the great majority of cases jaundice. This jaundice is not, however, obstructive, but due to a blood change dependent on the malady itself. The constitutional symptoms are always severe—the fever is high, there is great prostration, sickness, and diarrhœa, and the body rapidly wastes. Rigors and profuse sweats too are commonly observed, and are in a certain degree characteristic. The course of the disease is quite different from that of tropical abscess, for here the malady lasts only a week or two as a rule, whilst the other form may last for months, and is almost always more protracted in its course than the abscesses of pyæmia. As to the origin of pyæmic abscess, that may be any suppurating spot, however small, but most frequently it arises from ulcer or abscess in the course of the portal circulation. Hepatic abscess is always dangerous, not only from the constitutional disturbance, but still more from its tendency to rupture in uncertain situations. If it bursts into the pericardium or peritoneum, death soon follows; if it opens into the pleura or more directly into the lung, we sometimes see good results, but frequently also bad ones. The best termination is where the abscess opens either externally or into the bowels.

Should death happen we may expect to find appearances varying with the character and stage of the inflammatory affection. The early stage of inflammation is rarely observed save in the multiple abscesses, some of which may be in different stages. The central portion of the affected tissue is red and softened, surrounded by an area of tissue, more buff coloured. The central portion later assumes a paler aspect, and then is found to consist of liver-cells in varying stages of disintegration, ending in a mass of granular débris. Pus forms in isolated spots, which speedily run together, and an abscess forms, surrounded by liver-tissue in a disintegrating and discoloured condition, ragged and shreddy. Or again the abscess may be encapsulated in a well defined cyst-like membrane, and this is especially the case in those of long standing. The

quantity of pus contained in tropical abscess is sometimes very great, amounting to many (even seventeen) pints. The pus itself is usually of the ordinary character, but may be altered in colour by blood and bile. The history of pyæmic abscess is of course different; beginning with the impaction of a mass of putrid material, we may expect a localized mortification or gangrene to take place, and the tissues to break down into a purulent mass, mixed with the real products of inflammation. The abscesses, as already pointed out, are numerous, and rarely of any great size.

Treatment.—The early stage of hepatic abscess resolves itself into hepatic congestion: hence the treatment is identical, and consists of local bleeding, poulticing, and warm fomentation, saline purgatives, and restricted diet. But when the signs of abscess are fully established, we must modify the procedure. Thus we still continue the poultices and fomentations, but purgatives are now worse than useless, and we may even be called upon to treat diarrhœa. The diet should be good but plain, and tonics with wine should be freely administered, for much depends on keeping up the patient's strength during the trials to come. In purely tropical abscess, particularly of the malarious sort, Indian practitioners speak highly of ipecacuanha in the same large doses (20 or 30 grains of the simple powder) which they give in dysentery. However, when abscess has freely formed, we are now in a position to make use of a means of treatment not available in former days, and of the very greatest service. That is aspiration. In the olden times what prejudiced practitioners against opening the abscess was, firstly, the risk of escape of pus into the peritoneum; and secondly, the invariably bad effects which followed the admission of the air into the suppurating cavity. There was also the risk of not finding the abscess until it had fairly pointed. Nowadays we need only wait to satisfy ourselves of the existence of an abscess, as indicated by chills, perspiration, and some slight indication of its whereabouts, to attempt relief by employing a very fine needle; we need fear no risk in perforating the peritoneum, or even the liver tissue, and if we reach the abscess aspiration will soon withdraw the pus. It is unnecessary to introduce any antiseptic at this stage, though, if the formation of pus continues, and complete relief is not afforded by one or two operations, something of the kind may be tried. If during all this time we can keep up the

patient's strength, his subsequent recovery may be looked forward to with hopefulness, especially if he is able to secure a change of climate. The puncture ought to be made if possible distinctly below the ribs, and as near the mesial line as possible, not between the ribs, if that can be avoided; but this is of less importance in aspiration than in ordinary puncture. The treatment of pyæmic abscess is unfortunately not so satisfactory, for here we have to deal with a general condition of which the pyæmic abscess is but the local indication. Medicine does little good: we must rather trust to good food, wine, and hygienic measures, particularly plenty of air and light. For the rigors and hectic, quinine and the mineral acids are of most service, whilst the local or subcutaneous use of morphia must be employed to relieve pain. Vomiting, diarrhœa, and all other symptoms must be treated as they arise.

CIRRHOSIS, OR CHRONIC ATROPHY OF THE LIVER.

Chronic atrophy of the liver, which is also sometimes described as chronic interstitial hepatitis, is a malady characterized by increased growth of the connective tissue of the organ, with subsequent contraction and wasting of the proper substance of the liver. As the mischief seems in great measure due to the abuse of alcoholic liquors (hence more common in men than women, and in adults than young people), particularly spirits, it is sometimes known as "gin-drinker's liver," and from its appearance and feel it is also described as hobnailed or granular liver. It is certain, however, that cirrhosis may occur independently of these conditions, and it is only stultifying ourselves if we persist in all cases in insisting on the origin in spirit-drinking when no such origin exists. Cirrhosis is not, moreover, the only form of small hard liver; in the form already described as nutmeg-liver, we may have diminution in size, due, however, partially to change within the lobules, not to change without, as in cirrhosis, and it is possible to have the two kinds of atrophy combined. There is besides a form of simple atrophy, where the organ is diminished in size, is granular, and even nodular, but there is no excess of the fibrous element, and the liver is softer than usual. In the peri-hepatitis which so often seems to arise in the last stage of syphilis, we often find contraction of some portion of the liver and scar-like bands running across its surface; but it is rare

to have the whole substance affected, and we never encounter the hobnailed appearance; the surface is even and smooth. Yet again there is a form of contracted liver with neither thickening of the capsule nor a granular character; it is uniform on section, dark red, and highly pigmented; there is little tendency to division into lobules, and the portal vein is obstructed, its capillaries ending in culs-de-sac. All these maladies are characterized by diminution in size, and all have been confounded with true cirrhosis.

In the first stage of cirrhosis we have distinct enlargement of the organ, sometimes to a very considerable extent, the surface of the organ is covered by a thickened peritoneum, but it is still even, and on section there is no appearance to distinguish the new growth from the old till the substance be examined under the microscope, and the small round cells and corpuscles of the growing connective tissue are brought out. Later, when contraction has fairly set in, the liver becomes smaller and its shape altered, so that the right lobe tends to assume more and more a spherical appearance, and the left to waste even more: the surface is no longer smooth, but granular. Sometimes the granules are small and regular; but often instead we have masses here and there projecting between the contracted tendinous-looking bands of the serous coat and capsule. The outer coat, too, may adhere by dense bands to surrounding organs, particularly the diaphragm. On cutting into the liver, it is felt to be unusually hard and tough, and the cut surface is granular—the granular appearance being due to the remains of the liver-tissue lying between the fibrous bands of new formation. The islets included within these bands are very often deeply stained with bile, and if their substance is examined microscopically the liver-cells themselves are found diminished in size and granular or fatty. The yellow colour of these granular cells and masses gives the name (κιρρός, yellow), to the disease.

The early indications of cirrhosis are rather obscure, but there is, it may be, some pain and more tenderness, and both may be severe. Moreover, there is disturbance of digestion, very probably depending on chronic gastric catarrh arising out of the same causes that produce the cirrhosis. Such are loss of appetite, weight after food, flatulence, and disordered bowels. Later, we have symptoms more marked in character, depending on obstruction to the flow of blood through the portal system. These first show themselves in congestion of the stomach

and bowels, aggravating the previous catarrhal condition, and giving rise to piles, which are usually a most troublesome complication. This congestion tends to relieve itself by occasional hæmorrhages or diarrhœa, so that these may give us the first evidences of liver contraction. These hæmorrhages are often very severe, and may prove fatal. Other signs of portal obstruction manifest themselves, fluid tends to accumulate in the peritoneum, ascites being one of the most certain results of cirrhosis. At the same time the veins on the surface of the abdomen enlarge, in this way making up for the obstruction to the passage of blood from the abdomen. This ascites is often very severe, and compresses the abdominal cava, so that there is obstruction to return of blood from the lower extremities. These may swell and become œdematous, but the ascites comes first, and is always out of due proportion to the last. The same condition gives rise to difficulty of breathing, which (together with the weight on the abdomen) may prevent the individual from moving about, and it may even by compressing the renal veins give rise to albuminuria. Jaundice to a small degree is common enough in cirrhosis, and the patients always have a dirty yellow colour; jaundice to any considerable extent is rare. Whether this slight jaundiced tinge is due to absorption of bile owing to compression of ducts is doubtful, for there are other signs to show that in particular in the later stages of cirrhosis there is a profound alteration in the quality of the blood, which is undoubtedly of the first importance. In such patients there is a great tendency to small bleedings in spots where there is no obstruction to the blood current, and any injury to the surface is promptly followed by an hæmorrhagic infiltration, whilst purpuric-looking spots without any known cause form on the surface, and bleeding is readily induced in any mucous membrane. The fæces are rarely, if ever, without bile, whilst the urine is scanty and contains much pigment and lithates. It is probably to this change in the constitution of the blood also that are due the profound and serious nervous symptoms which sometimes usher in death in cirrhosis, for the delirium ending in coma, and still more frequently coma alone, are common terminations of the malady, as is intercurrent pneumonia, with or without pleurisy. There are, however, more demonstrable signs of the malady besides those mentioned: these are, diminution of the liver and increase of size in the spleen, the latter being

an inconstant symptom. It is not necessary that there should be very great diminution in the size of the liver, if the structural changes are profound, to give rise to serious symptoms; but usually we find diminished size before the more serious symptoms appear. This is indicated in two ways—a diminished area of dulness, and by the inferences from palpation. The area of dulness is markedly diminished, sometimes to one-half, the atrophy of the left lobe being much greater than that of the right. If there be ascites, for the reason so often insisted on we must be careful in drawing our conclusions from percussion as to the size of the right lobe, as from its altered shape the ascitic fluid is sure to interpose between the lower margin of the liver and the chest wall. By palpation we discover not only that the liver is smaller than usual, but also that its edge is harder and more irregular; this consequently must not be mistaken for cancer. The enlargement of the spleen is due to the portal obstruction, and is not present in above half the cases. It is not easy to separate the other forms of atrophied liver from cirrhosis by clinical signs; the most important factors are an absence of a history of spirit-drinking and a history of syphilis. Red atrophy is still more difficult of diagnosis, in fact, that may be said to be impossible. The termination of all these forms of liver atrophy is sooner or later in death, though that may be long averted. Sometimes the ascites seems to be the directly fatal cause, for operation intended to remove it, when the blood has become altered, is no longer a very safe measure. Most, however, die from emaciation and exhaustion, or from the nervous symptoms already mentioned.

Treatment.—The treatment of cirrhosis in its early stage is that of congestion of the liver, coupled with the prohibition of spirits. The food should be plain but good, and abundant exercise should be persisted in. The bowels should be kept open by the salines already indicated, and great benefit will be derived from the use of alkalies. The mineral waters of Vichy, Ems, Marienbad, and Carlsbad are specially indicated. In the second stage we must do our best to promote nutrition. The condition of the stomach and bowels imperatively demand attention, for with them we can do more than with the liver itself. Alkalies and bitters, alternating with acids and bitters, do good. Purgatives are absolutely essential, but great care is necessary in their selection. Podophyllin, with compound

extract of colocynth and belladonna, often answers well. Upon the whole, trying to get rid of the fluidin the abdomen by purgatives is not satisfactory, especially if the ascites is very great. If tried, no one should be too long continued, but changed for another after a time. Diuretics are of more value, as experience also teaches, especially the digitalis, squill, and blue pill mass (pulv. scillæ, gr. j, pulv. digitalis, gr. j, pulv. hydrarg. gr. ij. F. pil). Cream of tartar, too, or broom-tops (decoctum scoparii) are often very useful; when tapping is found to be necessary, we would again counsel the rule "festina lente," and let the fluid be taken away gradually with a small trocar. Remedies, especially diuretics, always act better after, and the removal of no great quantity may suffice, for there is not the slightest doubt but that we can expect much better things from the natural than the artificial removal of peritoneal fluid. It is quite different in pleurisy, or even in fluid from peritonitis. When hæmorrhage arises, except it be very copious, we should not be too anxious to check it; it is better to prevent it; and sulphate of magnesia with sulphate of iron and dilute sulphuric acid, given so as to purge, should be employed. Flatulence is always a troublesome symptom; the best plan is to relieve the gastric catarrh as far as possible, and for the time being to give the various essential oils in small doses. Strychnine is very useful in small doses; quinine, too, may be given in sulphurous acid; this will greatly tend to diminish heartburn and flatulence.

PERI-HEPATITIS FROM SYPHILITIC DISEASE OF THE LIVER.

Recently we have agreed to recognise certain appearances in the liver as due to syphilis. These are of two kinds, and occur in the third stage of the disease—that, namely, of deposit. Such are also common in the subjects of congenital syphilis. The first of these is the gummy tumour: this varies in size, but seldom exceeds that of a hen's egg, and early tends to assume a yellow cheesy appearance. When near the surface it often disappears completely, leaving behind a scar-like tissue, which often assumes the appearance of a fissure, and this, too, we nowadays rightly or wrongly recognise as syphilitic. The scar-like tissue is often the consequence of an attack of what is called perihepatitis, or inflammation of Glisson's capsule. The signs of this condition during

life are so vague as rarely to admit of diagnosis; if our attention be directed to the liver, and if there be a history of syphilis, we may, if the notching be unusually well marked, make out the nature of the complaint, but such an event must be rare.

The *treatment* is merely that of advanced syphilis; most of the specimens we see are in individuals who have been perfectly cured.

ACUTE YELLOW ATROPHY OF THE LIVER.

This is a very rare form of disease, yet one about which there can be no question. It is characterized by jaundice, rapid diminution of the liver in point of size, with destruction of its cells, and ends in death. There is an acute change somewhat resembling this as far as fatty degeneration is concerned, which results from poisoning from phosphorus and arsenuretted hydrogen, but the symptoms have no analogy to those of this disease.

Acute yellow atrophy is most frequently encountered among females, particularly in the pregnant state, and strong mental emotion seems undoubtedly an important element in the causation; but so little is known of this as to leave the whole thing conjectural. The onset of the disease is not characterized by any very special circumstances: there may be distension of the alimentary canal, or there may not, for often the symptoms develope themselves quite suddenly, jaundice being the first serious indication of the existence of the malady. The jaundice is not, however, very severe, but the constitutional symptoms soon increase in severity. There is severe headache, irritability, and restlessness, ending in delirium and great prostration, coming on quite suddenly; there are muscular twitchings, tremors, paralysis of the sphincters, coma, and convulsions. The pulse varies: at first it may be quickened, but during the full development of the disease it falls below the normal level, but as the prostration increases, it too increases in rapidity while diminishing in power. Statements as to temperature vary greatly, some saying that it is high at first; but this seems certain, that during the greater part of the period through which the patient lives, it is much below the normal standard, except some complication comes on to cause its elevation. In its later stages there is much analogy between the symptoms of acute atrophy of the liver and a bad case of typhus fever.

Vomiting is a frequent symptom, and then disintegrated blood, as in yellow fever, is sometimes brought up; the stools too may contain the same material, whilst the altered blood is often effused beneath the skin. The spleen is generally enlarged, but this is not a characteristic sign. Much—in fact, too much weight, has been attached to the characters of the urine. The quantity of this is not greatly altered, but it is very dark, though no good reaction for bile pigment can be made out, and there is no reaction for the bile acids, as the test is usually and roughly performed. Urea and uric acid are notably deficient, and in their place we find leucin and tyrosin—constituents otherwise rarely found, save in the pancreatic products of digestion. Percussion shows diminution of liver dulness, going on rapidly from day to day, that of the left lobe going first, and it may be ending in total disappearance, due to falling away of the shrunken gland from the side of the chest. Death speedily occurs—generally in a few days, though sometimes only after weeks. When the liver is examined after death it is found greatly shrunken, especially in thickness, its covering hangs loosely about it, and its substance is flabby; when cut into, its colour is everywhere a dull yellow, and no lobules are recognisable. Examined by the microscope we see that the cells have undergone fatty metamorphosis, and have disappeared, leaving only a granular and oily mass, with pigment granules, behind. If some of the cells are found, they appear crammed with oil, thus showing that the nature of the process is an exceedingly rapid fatty metamorphosis.

Of *treatment* we are not in a position to say anything. Purgatives have been recommended in the early stages, but later, when the nervous symptoms have come on, we can only try to do the best we can with each as it arises.

ENLARGEMENTS OF THE LIVER.

I. FATTY LIVER.

As in the case of the heart and other organs, we may have two forms of fatty liver: in one there is an increased deposit of fat in the cells of the organ; in the other, its essential constituent cells undergo fatty degeneration. The most frequent cause of fatty degeneration of the liver in this country, is excessive eating and drinking, and the want of exercise. The worst specimens we have seen, where the liver was enormously enlarged,

so soft as to be almost diffluent, and floating in water, occurred in women who had been for years taking "drops of brandy for the spasms," and never stirring out of doors. In such persons we see a large accumulation of fat, and their muscles undergo fatty change, so that they have no strength left. When the muscles are exposed they are quite yellow, and yield copious drops of oil. The heart invariably suffers in this way, and the kidneys more rarely suffer in like manner. On the other hand, the liver may become profoundly fatty under totally different conditions; we very often see it thus in phthisis and in other wasting disorders, as cancer and intestinal ulcer. The mode of causation in the former instance is clear enough; in the latter it may be due to retarded metamorphosis, owing to imperfect respiration; but the same condition does not occur elsewhere when there is impaired respiration, and it is plain that such a theory will not account for the change in cancer and intestinal ulcer. We are therefore driven to the conclusion that when the nutrition is imperfect the tissues are imperfectly renewed and nourished, and consequently more prone to such change. Weakened circulation, too, has doubtless something to do with the change.

The appearance of the fatty liver varies greatly, according to the degree of the change. Microscopical fatty changes are common enough in all kinds and forms of disease, but the highly fatty liver is not so frequently encountered. When it is we find the organ enlarged and misshapen; its edges being thick and rounded; its covering thin, smooth, and shining; its colour, even before section, yellow, or yellow mixed with red, from the presence of blood-vessels. Commonly the colour is likened to withered leaves, but it may be very much brighter. The organ is soft, sometimes almost diffluent, so that it cannot be taken entire from the body under all circumstances; it cuts too easily, sometimes almost like a piece of butter, and the knife is stained with fat. What blood flows from the organ on section, and that is not much, has beads of fat on its surface. The section is yellow mottled with red. It is not easy to get a good section of such an organ for microscopical examination, for it is either too soft for immediate use, or preparation removes the fat, but we can get a fairly good one by partial freezing. Seen under the microscope, the liver-cells are filled with fat, which has collected into globules. The cells in the outer part of each lobule are those mostly

affected; those nearer the intralobular vein being less altered. The blood in such patients is sometimes profoundly altered, and the corpuscles broken down. The general signs of a fatty liver are not decidedly pronounced, but we may suspect its existence in very fat people, especially when the general fattening is due to alcoholic excess. There is, moreover, owing to the general fatty condition of the organism, a marked debility on the slightest exertion; and as fatty change in the heart generally in these cases accompanies the liver change, we may expect to encounter a feeble impulse, weak sounds, small, very compressible, and quick pulse, breathlessness on exertion, and a tendency to fainting. A peculiar soft, velvety look of the skin has also been spoken of as a sure indication of fatty liver but such is seldom seen, and a pasty or greasy look is much more common even in females. The organ itself is enlarged, sometimes so much as to compress the lung above, and to extend low down in the abdomen, but such a grade of change is not common; more frequently the liver is only moderately enlarged, and the enlargement is uniform. Sometimes its enlargement and smoothness can be made out through the abdominal wall. There is no pain, no tenderness, no ascites, and no jaundice.

Treatment.—Most frequently we detect fatty liver too late to be of any real service, and very often it is associated with incurable disease. But if we are consulted early enough by its subjects, especially where it is due to excess of food and drink, and to want of exercise, we may hope to do good if the patient can be persuaded to follow our advice. The patient must then give over most substances containing fat or butter in quantity; sugar altogether; and most substances containing a great quantity of unaltered starch. The food should therefore mainly be meat without much fat—fish, poultry, and game, with green vegetables. Stimulants are necessary in moderation, they should be claret and dry sherry. But this regimen, which is essentially that vulgarly called "Bantingism," may easily be carried to dangerous extremes, and should never be taken in hand too abruptly or too exclusively. Alkalies, with their carbonates, and salines, especially in the form of mineral waters, as those of Carlsbad and Marienbad, are of great service. Where these are not available, we must content ourselves with bitters, laxatives, and alkaline salts, given in ordinary medicinal doses. Later, the preparations of iron do good,

especially if in a saline solution, which will open the bowels. Such a combination is afforded by many mineral waters. In patients where fatty liver arises from wasting disease, such a mode of treatment is out of the question; here iron is the most important remedy, and the mistura ferri co. its best mode of exhibition.

II. WAXY LIVER.

The name waxy liver has been given to a condition also designated by the terms *bacony*, *lardaceous*, and *amyloid*. The term waxy is perhaps the least objectionable, as derived from the appearance of the organ—something like crude beeswax. Amyloid is derived from the peculiar reaction given with iodine and sulphuric acid, in some degree resembling that afforded by starch or cellulose, but the material is nitrogenous, and has not the slightest alliance to these; hence it is better to abandon the name. The waxy liver is almost invariably found associated with wasting disease, particularly suppuration connected with the bones and joints, with constitutional syphilis, phthisis, and other disorders of the kind. It is especially frequent in children, the subjects of long-standing hip disease, in whom most organs in the body are found thus affected. The change which ends in the production of waxy liver begins in the walls of the smaller blood-vessels, particularly the arteries. These become thickened by the deposit of a new material, and from them the change tends to spread to the tissues of the organ affected. The vessels are accordingly more rigid than usual, and their ordinary textures are no longer discoverable; they seem homogeneous semi-translucent tubes, with their calibre considerably narrowed. The cells undergo a similar kind of change. The granular matter, natural in liver-cells, disappears, and the clear waxy matter takes its place. They thus become larger, rounded, and firmly united the one to the other, and sometimes form masses whose structural characters are lost. The colour of these masses when seen by the naked eye is reddish-brown or yellow. If now to these spots a solution of iodine in iodide of potassium is applied, a mahogany colour is soon brought out; and if sulphuric acid be added, we may sometimes succeed in bringing out a violet or blue tint, but this is not always easily done.

The constitutional symptoms of waxy liver resolve themselves into those of the conditions which give rise to

it. In all cases these are accompanied by anæmia, and sometimes by hydræmia. There are marks of great debility, and, as we have before pointed out, the liver is rarely the only organ affected; the spleen is generally enlarged and waxy; the kidneys also suffer, and this gives rise to albuminuria, with copious discharge of urine of low specific gravity, without blood, and often without casts, with little or no tendency to uræmia, and very slight tendency to dropsy. If there is dropsy, it is quite as often due to the watery condition of the blood as to the liver or kidney disease. But ascites is not a common phenomenon in waxy liver, it is no part of the regular evolution of the disease, and is usually due to some accidental pressure on the portal vein. The stomach and intestines too are in most cases waxy, and so we very often have vomiting and diarrhœa of a very troublesome kind as complications which aid in producing the anæmia and increasing the general debility. In waxy degeneration the liver is as a rule enlarged, sometimes enormously so, but there is no pain in the side, at most only a feeling of weight; if, however, dependent on syphilis, peri-hepatitis of a painful kind may come in to complicate matters. Jaundice is rare; if it occurs it is accidental, and due to pressure on the ducts by some enlarged gland, or the extension of intestinal catarrh to the bile ducts. When the liver is examined we are almost always able to make out some enlargement, and this is in many cases enormous; but it is uniform, so that the shape of the liver is unaltered, except that the edges are rounder; it is smooth, resistant, and inelastic, and generally of slow growth. When therefore we make out such a liver in the subject of caries or necrosis of bone, of prolonged suppuration, or of constitutional syphilis, we should have our minds alive to the probability of the affection being of this waxy nature, especially if we have also a big spleen and abundance of albuminous urine without dropsy.

Treatment.—Our knowledge of the conditions which most frequently give rise to waxy liver gives us also the clue as to how to deal with them. Certainly the frequency with which it occurs in children the subjects of chronic hip disease, leads us to the belief that operation should be as early as possible in these, so as to prevent prolonged suppuration. Early operation should therefore be insisted on, since in some cases undoubtedly the liver diminishes in size when the purulent drain is

stopped. Such facts may lead surgeons to deal more speedily with joints which show no sign of improvement, and which are only ruining the constitution. In any form of this malady the food should be good and nutritious, and digestion should be promoted by all means in our power; bitters, with mineral acids, are undoubtedly the best remedies, but sometimes we may also require to give iron. If due to syphilis, iodide of potassium may be of value; it is best given in 30-grain doses in mistura ferri co., but the syrup of the iodide of iron may take its place in the case of children. Though more difficult of preservation and preparation, the prot-iodide of iron is probably a better syphilitic remedy than the form commonly used. Chloride of ammonium is also highly spoken of by some; it requires to be given in full doses of not less than thirty grains. It is well combined with the perchloride of iron, the two forming a useful compound, now expunged from the Pharmacopœia, which went by the name of the ammonio-chloride of iron. As vomiting and diarrhœa are apt to arise of their own accord, and sadly interfere with nutrition, anything which promises to foster their occurrence or their persistence should be strenuously combated and carefully avoided; for this reason mineral waters, which do good in other forms of liver mischief, are to be avoided, especially those which contain much neutral salt. A change of climate is often of great service.

III. CANCER OF THE LIVER.

Of all internal organs the liver is most frequently the site of cancer, and if cases of primary and secondary cancer be included, it may even be said to be of all organs in the body that most frequently attacked. The cancer may originate in the liver itself, or the organ may be affected secondarily. Very often it follows on cancer of the breast in females, but it may also follow cancer in any of the organs whence the blood supply of the portal vein is derived, the stomach, rectum, uterus, and intestines especially. Secondary cancer of the liver may occur at any age, but the primary form is rare until after middle life. In primary cancer the hard or scirrhous form is most frequently encountered, but in the secondary it is most frequently medullary, sometimes melanotic. The cancerous masses too are most frequently diffused throughout the liver, and isolated the one from the other. In size they

vary very greatly, from a pea to the size of the fist, or greater. Sometimes we find only one mass, sometimes very many, and they may be completely buried in the substance of the liver or project from its surface. We seldom find the cancerous masses in the liver of a gristly hardness, but often they are firm and brawny, especially on the outside, though sometimes soft and diffluent, especially in the centre of the masses. The appearance of the cancerous growth on section varies with its vascularity. The colour of the cancer is white, but the involved vessels give it red streaks and points of yet darker red if its vessels have been ruptured, or, it may even be quite black from melanotic deposit. In ordinary cases the so-called cancer-juice can readily enough be got by scraping the mass, varying however in quantity with the density and stage of the growth. There is no distinct boundary line in growing cancer between the new growth and the liver substance, but this last is usually hyperæmic, and sometimes deeply stained with bile. If near the surface we find that the peritoneal coat is thickened, and often adherent to adjoining organs, especially if nodules of cancer project from its surface. In this last case we may have a copious effusion of fluid due to peritonitis. As pointed out already, the central parts even of hard cancer tend to soften, and may be quite diffluent. This is of the nature of a retrograde change. Colloid cancer is rare in the liver.

The symptoms of hepatic cancer are at first very vague, and may remain so throughout the case, being only discovered after death. Usually, however, in the more advanced stages, its diagnosis is easy. In almost all cases we have pain, especially if the masses come near the surface and set up peritonitis; then the organ is tender as well as painful. We have also deranged digestion and irregular bowels. As the liver is almost invariably enlarged, we have local signs of this in a sense of heaviness. On physical examination the enlargement is usually easily detected by palpation, seeing that emaciation is an early symptom; but the rigid rectus muscle for the protection of the tender organ must not be mistaken for such. The enlargement goes on, so that we can make out the actual growth of the organ under examination. The enlargement is seldom uniform, and in most cases we can make out nodules, or tubera, with dimpled surfaces as they are called, on the part of the organ uncovered by the ribs; but such may be entirely absent, and the cancer completely involved in the liver substance. This

nodular mass is usually hard and resistant, but if medullary is quite soft, but not fluctuating. In almost all cases we have the peculiar cachectic look of cancer, though this may be absent till late in the disease, but besides we have often more or less jaundice. The jaundice depends on the site of the growths; if these compress the bile ducts, especially in the porta, then we are sure to have jaundice, but it may be totally absent throughout the disease. If, however, jaundice does occur, it is usually progressive, and sometimes very intense, so that the patient is almost black. From a similar accident—*i.e.*, pressure on the portal vein—we often have ascites, but it must be remembered that the excessive peritoneal fluid may be due to peritonitis and not to obstruction. In cases of portal obstruction the spleen may be enlarged, and the superficial veins of the abdomen distended, but the spleen is not so often enlarged as in pyrexial disease. The bowels in cancer with jaundice are usually confined, and the stools clay-coloured. Under such circumstances, likewise, we have the urine impregnated by bile. Death commonly occurs from exhaustion in a varying period—much earlier in medullary than scirrhous disease. Scirrhus may last for a good long time, but if the disease lasts for more than two years this is an important element in the diagnosis against its being cancer.

The *treatment* of hepatic cancer can only be palliative. Especially we must try to alleviate pain and keep up nutrition; but the former is often easier than the latter, for the appetite is sadly apt to feel the depressing influence of the disease. As starchy and fatty foods act as stimulants to the liver, they are best avoided; and the patient should be fed on soup, with lean meat and green vegetables, as far as possible. The digestive organs must be looked after, and appropriate remedies given as occasion arises. Flatulence and constipation, both probably due to chronic catarrh, are often troublesome, and must be dealt with on the ordinary principles, but powerful remedies are better avoided. For the pain we must give opium subcutaneously, and if there is a local peritonitis, apply turpentine stupes freely. When there is much tenderness we can apply a blister; and when the cuticle is removed, sprinkle half a grain of morphia over the spot. Poultices too are often very grateful. It is seldom advisable to tap, even if the ascites be very great.

IV. HYDATIDS OF THE LIVER.

From its situation the liver is peculiarly prone to the invasion of parasites which have been swallowed, or otherwise made their way into the alimentary canal. The exact history of the parasite of which hydatids are one development, has been fairly satisfactorily made out. It is one of the teniæ or tapeworms (*T. echinococcus*), inhabiting dogs and wolves, the mature eggs of which, containing embryoes, being voided by the dog, make their way along with food or drink into the human intestines, and thence, partly by their own endeavours, partly by the blood current, the young parasite, freed from its enveloping sheath, makes its way into various organs of the body. In the liver the tail, as it might be called, of the embryo, enlarges and forms a vesicle, and on the inside of this vesicle, new vesicles of smaller size, each containing its embryo, form, and again, it may be, inside those others originate. The enclosing vesicle of course enlarges, to accommodate the new growths in its interior, so that when fully developed we find in the interior of the liver a tough fibrous capsule, lined by a finer membrane which constitutes the hydatid wall. In the interior of the cyst, according to its degree of distension, we may find a clear watery fluid with thin transparent vesicles floating in it, or crammed with a mass of collapsed vesicles, together with others in all stages of development. The very small vesicles, not bigger than a pin's head, are adherent to the wall of the sac; the large ones are quite free, and contain within themselves a fresh brood. The smaller ones too are clear and transparent, the larger dense and horny. On the inside of the larger we can see a kind of gritty or granular-looking bodies adhering to the walls of the cyst; these are the young echinococci, who have not yet developed a vesicle, each with its hooklets and suckers, the head invaginated in the body ready to become a vesicle. The whole of the contents of such a sac sometimes die, and gradually become converted into a fatty or chalk-like substance enclosed in the dense capsule, and on these we sometimes come in the liver when there has been no history to indicate the existence of any such parasite. The right lobe of the liver is perhaps more frequently affected than the left, and if the sac increases to any size, considerable deformity must

result; the liver tissue disappears, and if the mass reach the surface it projects, and may then be detected. The size of course is very variable, from the size of an egg to something enormous. By increased thickening of the sac, the parasites inside it tend more and more to become starved, and it is probably in this way that they are sometimes finally destroyed. But, on the other hand, by continued growth of the contents, they sometimes tend to burst, and this of course may happen in various directions—one of the most frequent is into the right lung or pleura: if by the lung the parasites escape, and the patient may recover; but if by the pleura, there is set up an inflammation which almost inevitably ends fatally. Sometimes they open into the pericardium, again with fatal issue, or into the peritoneum, which is also for the most part terminated by fatal inflammation. This mode of termination may be brought about by a slight injury, which would otherwise have had no evil effects. Again, they may make their way out through the parietes, or by the stomach or bowel, which is probably the most favourable mode of ending. More rarely the hydatids have made their way into the bile ducts or blood-vessels, but if bile finds its way into the hydatid sac, this may end in recovery, for the bile kills the parasite, and shrivelling follows. The irritation of the sac, if near the surface, usually gives rise to some degree of peritonitis.

The symptoms of hydatids are till the cyst is discovered hardly noticeable; the first intimation of their existence is often also the last, being the bursting of the sac; but if the tumour be very large there is more or less weight in the side, very likely interference with breathing, and it may be some sharp attacks of pain from slight peritonitis. When the side is examined, we find it, if the tumour be large, bulging and dull over a varying area, according to the growth of the tumour, for as the growth is not uniform the dull area varies in shape as well as in extent. To the hand the tumour gives a kind of elastic feel, sometimes even fluctuation may be detected; it is smooth and globular. On perceiving such a tumour near the surface, we are sometimes able to bring out a peculiar thrill called hydatid vibration; but it is often absent, and can only be present when there is a goodly quantity of fluid. As in other maladies of the liver, we may have both jaundice and ascites from hydatids, but both are accidental and dependent on the site of the tumour. Care must,

however, be taken not to confound a large hydatid cyst with ascites. Neither the spleen nor the kidneys are as a rule interfered with. The disease is of slow progress, and has generally existed for years before being detected, if it be so at all during life. Ultimately it may lead to death by rupture, as already described, or by wasting and want of nutrition from interference with other organs, or by suppuration.

Treatment.—Many remedies have been proposed for this parasite, but there is only one mode of treatment effectual —that is, by evacuation. It is not absolutely necessary, as far as we can make out, to evacuate the whole contents of the sac: if we remove the fluid by means of a fine trocar and aspirator, we shall probably cause the cyst to shrink, and this may be followed by the same kind of process as we see in spontaneous cures. There is even reason to believe that piercing the sac with a fine needle and allowing the fluid to drain off into the peritoneum, may be followed by a good result. Any injection is unnecessary; if anything more be required, the operation had better be repeated. Sometimes, however, after repeated tappings the sac suppurates and pus forms. When such is the case, other procedure must be adopted: we must then lay open the cavity freely, or introduce a drainage tube with two openings, through which disinfectants, as carbolic acid and water, permanganate of potass and water, and the like, should be freely injected, so as to wash out the cyst. If the patient be strong enough to stand this, he will probably recover. It is far better, however, to avoid this amount of suppuration if we possibly can.

ICTERUS, OR JAUNDICE.

By icterus or jaundice we mean a condition of the skin and tissues generally, in which they are dyed yellow, most frequently from bile, but sometimes also from alterations in the blood itself. It is plain, therefore, that jaundice is only a symptom, but a symptom of very considerable importance.

The most frequent form of jaundice undoubtedly is that which is due to obstruction of the bile ducts and reabsorption of bile, and this happens the more readily as the expulsive power in the bile ducts is very weak, being mainly the vis à tergo arising from continued secretion. It is better in every way to discuss these two branches of jaundice separately, including in the description of the ordinary variety those symptoms which are common to the two.

OBSTRUCTIVE JAUNDICE.

Obstruction of the bile ducts may be brought about in various ways; one very common cause is gall-stones. The phenomenon accompanying the passage of gall-stones must be considered separately, but as far as jaundice from this cause is concerned there are pains of a very severe kind, rigors and vomiting, with the speedy accession of the yellow tinge all over the body, and an abundance of bile in the urine. The jaundice from gall-stones is seldom permanent, and with it there is no fever; we can sometimes also make out the enlarged gall-bladder after a time. Gall-stones and jaundice arising from them are most common in people of a sedentary habit, and of middle age, but the most satisfactory proof of the origin of the jaundice is finding the gall-stones in the motions, though not finding them is no proof of their absence. Hydatids, as we have seen, may occasion jaundice; so too may other liver parasites, such as *Distomata*. This may arise in two ways; thus the hydatid tumour may open into the bile ducts, and though the smalier hydatids may escape, and the larger ones remain behind, still some may get far enough to block up the main tube. Here we have the signs of a hydatid tumour to begin with, and very likely signs of its subsidence, as well as of the passage of unusual matters by the bowels, especially we may be able to detect the peculiar worms or their hooklets. In this case there is not usually the pain of gall-stones, but it may possibly exist in equal severity. Very likely there may be some fever from the dammed-up bile making its way into the hydatid cyst, and there exciting inflammation. When the symptoms of jaundice arise from the pressure of a cyst they are more obscure, and so, or if possible more so, are the signs of obstruction by a flukeworm. Foreign bodies sometimes, but rarely, enter the gall ducts, and so cause jaundice; worms have been known to do so, and so too even more rarely have fruit-stones. A much more frequent, probably the most frequent form of obstruction is that which arises from catarrh of the bile ducts, and the consequent tumefaction of the lining membrane; usually the catarrh begins in the duodenum or stomach, so that we have signs of its existence there before it spreads to the bile ducts and the jaundice begins. Occasionally children are born with deficiency of the bile duct, but this is rare, and the ordinary jaundice of newly born children is not to be confounded

with that arising from this cause. Stricture of the bile duct may arise from inflammation affecting the capsule of Glisson in the porta, or we may find the obstruction at the other end in the form of a cicatrix from a healed duodenal ulcer, or we may have ulceration of the bile ducts themselves, beginning with an impacted gall-stone, and ending in cicatrization and subsequent stricture. Not unfrequently we find obstruction by a new growth in the passage itself or closing its orifice. Cancer of the head of the pancreas is not a very unusual circumstance, and when it occurs we may expect the ductus communis to be literally obliterated. Much more rare are new growths in the bile ducts themselves, yet we have seen a very perfect example.

The causes of obstruction arising from outward pressure have in great measure been already discussed as far as the liver is concerned. We have seen that cancer, hydatids, and even abscess, if favourably situated for the purpose, may cause obstruction. Still more frequently do we find enlarged lymphatics in the porta a cause of the jaundice; in this way cancer often gives rise to it, and waxy liver, which is not itself accompanied or indicated by jaundice, may thus give rise to it. Tuberculous glands less frequently give rise to such a symptom. A large cancerous mass at the pylorus will sometimes so press on the ductus communis as to obstruct it, and so give rise to the jaundice; but here too enlarged portal glands, or the formation of a new growth behind the peritoneum or in the liver itself, are more frequent causes of the jaundice. Other modes of compression there are; from tumours of the pancreas, tumours of the kidneys, and abdominal aneurism. Hardened fæces accumulated in bulk may sometimes also produce compression enough to give rise to jaundice.

The signs of jaundice develope themselves with varying degrees of rapidity, and sometimes one sign, sometimes another first attracts attention. Most frequently the first thing noticed is the yellow skin and conjunctivæ, but occasionally the staining of the linen by the urine, which occurs first, is previously noticed, for we find the indication of bile in the urine before we see indications of it in the tissues. The depth of the tint in jaundice varies greatly, from a light lemon to a deep dark green, almost black colour. All tissues and organs are stained more or less, but it rarely shows itself in the mucous membranes. The rapidity with which the jaundice is developed depends on the completeness of the obstruction; that ma

not be complete, and if so, no great depth of colour may ever show itself. The conjunctiva and sclerotic, from their clear whiteness, generally show the tinting first, and the existence of tinting here is of value as a diagnostic to separate some conditions where the skin is dyed something like what it is in jaundice.

The secretions are stained with the bile pigment, the urine especially so, for it is by the kidneys that the absorbed bile is mainly extruded from the system. The tint of the urine varies greatly, and even varies from day to day. Sometimes a correspondence may be observed between the depth of hue of the skin and that of the urine. This urine stains the linen yellow or brown, and even the perspiration, particularly in the armpits, carries pigment with it, and stains the linen. The mucous secretions are not so stained, nor is the saliva, except it be unnatural as in ptyalism, but most of the others may be. The existence of bile in the urine and other secretions is usually determined by one of two tests. One of these is for the bile colouring matter, and is called *Gmelin's test*. We take on the end of a glass rod a drop or two of nitric acid, and place it on a white porcelain plate; and again, after cleaning the rod, we dip it in the urine, and, in the same fashion, place a few drops of it on the plate, removed some little way from the acid; we then by degrees bring the two together, noting what takes place when they meet. If the urine be quite fresh, we probably first see a green brought out, next a blue, next a violet, next a purple, next a pinkish-red, and finally a brownish-yellow; often, however, the series is incomplete, especially if the urine has stood for any length of time, and the pigment has become partially oxidized. Another test is also employed, but less frequently; it is both more difficult, and as ordinarily performed more uncertain. It is called *Pettenkofer's test*. It is intended for the detection of the bile acids, but fails to do so with perfect accuracy, except they be separated from the urine by a complicated process. It consists in the addition of sugar and concentrated sulphuric acid to the urine, but as the action of sulphuric acid on ordinary (cane) sugar gives rise to a colour which may readily be mistaken for the bile acid reaction, it is better to use a solution of grape sugar, which is not so affected. In the presence of these reagents the bile acids give rise to a purplish colour, but this should always be compared with the same reaction effected by concentrated bile.

With jaundice we always have disturbance of the alimentary canal: there is a bitter taste in the mouth, and a sad loss of appetite; there is great flatulence, and the bowels are confined, whilst the motions when passed are clay-coloured or white from deficiency of bile, and smell of putridity rather than of fæces. This is owing to the want of the preservative effect of the bile and its stimulant action on the intestines, for undoubtedly bile tends to prevent decomposition, and to stimulate the natural action of the gut. The digestion of fat is also interfered with, for, as pointed out in a previous part of this work, the action of the bile is essential to the absorption of fat. Thus absorption suffers in the absence of the biliary secretion in the bowel, and this is greatly aggravated when the pancreatic duct is also obstructed. For these various reasons emaciation proceeds rapidly, except we counteract it by a more than usually copious meat diet which is still capable of being digested and absorbed. Hence too marked debility is an early sign of the mischief going on, but it is perhaps less noticeable than the peculiarly apathetic mental condition which develops itself. The patients do what they are told, but have no inclination for exertion, and always seem half asleep. Hence, too, we have a slow pulse, perhaps about forty, or even less, and diminished bodily temperature.

The existence of bile in the blood, is shown in other ways than those already alluded to: the skin is usually dry and scurfy, and very itchy (warm alkaline baths are the best remedy for this), and there is a tendency to skin eruptions of various kinds—one has been mentioned as peculiar, and called vitiligoidea, but it is absent in most cases of jaundice, and is found where no jaundice is. Another curiosity of the same kind is xanthopsia, or yellow vision. The altered condition of the blood is further indicated by the tendency to hæmorrhage, which shows itself in small extravasations below the skin, or in larger and even fatal hæmorrhage from the stomach and bowels. This, indeed, is one of the modes in which jaundice may end when it terminates fatally. Far more frequent, however, are signs of nervous disturbance—delirium, chiefly of a muttering kind, ending in coma, alternating with convulsions, muscular twitchinge, &c.; these are most frequent in the other variety of jaundice, but occur in the course of very protracted cases of the obstructive kind.

After death we find in prolonged cases of obstruction

the liver enlarged, and the bile ducts projecting on its surface. The shape in such extreme cases is altered, as the organ looks thicker and its edges are rounded. On section in such a case as this we now describe, and which recently came under notice, the bile, in a concentrated state, gushes out from the enormously dilated ducts to such an extent that we are at a loss to understand how the pressure of its accumulation could have been overcome by the secreting cells. The liver itself is strongly jaundiced: in some cases deep olive green, in slighter cases various shades of yellow. On examination the cells are found to contain more pigment than usual, so that the whole contents are coloured. The pigment may even be collected into isolated masses. All the organs are found more or less dyed, and if there be any effused fluids these too are yellow; even fibrinous clots in the heart are dyed. The nervous tissue is seldom pigmented to any extent, but, on the other hand, the kidneys, particularly the Malpighian bodies, are markedly so. Their colour may be dark green, and quantities of pigment may be seen in the tubules; in the straighter tubules this may be a coal-black mass.

Treatment.—The treatment even of obstructive jaundice is unsatisfactory; of the other variety still more so. When due to full living, the treatment of the jaundice may be said to resolve itself into that of gall-stones, hereafter to be discussed. We can do little or nothing in a good many cases, such as jaundice from obstruction by parasites, cancer, stricture, and so we must deal with symptoms as they arise. First we must endeavour to keep up nutrition, and for that purpose, as we have already indicated, a copious meat diet is essential. We may, if necessary, aid its digestion by giving nitro-hydrochloric acid and pepsine along with or just after each meal. Again, we must try to prevent putrefactive changes. This is best done by antiseptics like creasote and carbolic acid. These are best given in pill, in the dose of two or three drops, and should be given an hour or two after food, when the stomach has already done its work. We must also try to regulate the bowels, and to keep them open: for this there is nothing better than the compound rhubarb powder in twenty or thirty-grain doses from time to time. An aloetic pill is also useful. Some people strongly commend the giving of purified ox or pig gall in doses of from five to ten grains, but it is but a feeble substitute for the natural secretion. It too should be given some hours after food. We should

endeavour to keep the skin and kidneys as the great emulgents for the retained bile as active as possible, and nothing is so useful in this way as moderate warmth. As already pointed out, alkaline warm baths do much to relieve the itchy skin. Vegetable bitters are always useful for promoting digestion, and should be varied from time to time. Iron is not well borne, but quinine does good. Stimulants are always necessary in protracted cases, though better avoided when we are likely to overcome the difficulty causing obstruction. And in those cases, when it is overcome, we should try to remove the dye from the skin by warm alkaline baths and the like. These are the means to be adopted when we cannot get at the obstruction; if that can be removed, or its removal facilitated, then we must look to that. The two most common causes—gall-stones and catarrh of the bile-ducts, we shall discuss separately.

JAUNDICE WITHOUT OBSTRUCTION.

There is a well-defined group of cases, in which there is no obstruction to the flow of bile, and yet in which jaundice is a well-marked symptom. Various explanations have been advanced to account for this phenomenon, but the only satisfactory one seems to rest on the fact that the origin of the bile-colouring matters (bilirubin and biliverdin), is the colouring matter of the blood (Hæmoglobin), and in fact that Hæmatoidin, the altered colouring matter found in old blood clots, especially in the brain, is identical with bilirubin. Hence to understand the causation of jaundice without obstruction, we have but to account for the existence in the blood of an agent capable of breaking down the blood corpuscles, and we can account for a jaundice where the bile is not arrested, but flows as usual into the intestine, where there is no biliary congestion of the liver, and where the symptoms point to systemic rather than to simply liver mischief.

Now we have examples of this condition in several diseases, the pathology of which is not well known to us. Foremost among these comes yellow fever, in which there is a marked breaking up of the blood corpuscles, as evidenced by black vomit, jaundice, and albuminous urine, whilst there is plenty of bile in the evacuations. Again, in malarious disease, as seen in the eastern hemisphere, especially in remittent and intermittent fevers, but more so in the former, jaundice is a

common phenomenon. True jaundice in such maladies is sometimes due to congestion; but again we have it with the usual nervous symptoms of delirium and a tendency to coma, starting muscles, and complete prostration, whilst there is no obstacle to the flow of bile. But we have perhaps a better clue to the origin of such forms of jaundice in the curious disease called intermittent hæmaturia, which is also of malarious origin in some cases, and which has yet to be discussed. In relapsing or famine fever we have often jaundice, sometimes as before from congestion, but also with symptoms closely resembling yellow fever, and indicating a greater degree of nervous disturbance than does the ordinary form of the fever. More rarely by far does jaundice occur as a complication in typhus, typhoid, and scarlet fevers; whilst a kind of epidemic jaundice existing by itself has been described. Here we have poison, or at all events, morbid conditions to account for the blood change; but this is even more marked in certain other classes of cases. Thus, in pyæmia—whether we admit the actual existence of pus in the blood or no—we must admit the existence of some septic material in it, and this is undoubtedly accompanied by jaundice in a large proportion of cases. True, the jaundice is not very severe, but it is not severe, as a rule, in any of the cases we are describing; and in pyæmia there is distinct staining of the sclerotic, though there is plenty of bile in the stools; but the urine contains bile-pigment, and is albuminous. In snake-bite we have still more distinctly a poison introduced into the system, and here too we have jaundice, sometimes very intense and developed with extreme rapidity. Various other poisons may give rise to this form of jaundice, particularly phosphorus and arseniuretted hydrogen; but these also give rise to fatty changes in the liver. We have, however, another form of jaundice still, allied to this, yet different—we mean, that which is the product of mental emotion. Such we have seen in a high-spirited student, who had counted somewhat too confidently on passing his examinations, and been rejected. In such cases a nervous origin is apparent, but how to account for its action is not easy; perhaps we have a clue in the action of inhibitory and stimulant nerve fibres in other parts of the body. The old theory was spasmodic contraction of the bile-ducts, but that can hardly hold good. Another form still, is the jaundice (if such it can be called) which sometimes follows congestion of the

skin, especially if followed by a depressed or weakened circulation. The *icterus neonatorum* is probably of this kind, and certainly has some relation to the change in the mode of circulation which takes place at birth.

Each of these varieties of jaundice has symptoms of its own, depending more on the condition which has given rise to the jaundice than on the jaundice itself; but whenever it appears, the nervous symptoms so often referred to, and albuminous urine, are much more prone to occur than when the blood is not poisoned with the products of its own decomposition. After death in such cases, we have too frequently nothing in the liver to indicate the cause of the mischief. The liver itself is not greatly jaundiced, whilst the contents of the alimentary canal are of a normal colour, and the gall bladder is not overdistended. In the liver itself, and probably in other organs, we have indications of parenchymatous change—mainly of the kind called "cloudy swelling"—or it has gone further than this, and the cells are partially broken up.

As for *treatment* we can say nothing. If the nervous symptoms already described supervene, we must stand by and wait the result, which is almost invariably fatal; we can do nothing of practical value. Stimulation is the only thing we can have recourse to in hopes of tiding the patient over his dangerous state.

PYLO-PHLEBITIS.

Inflammation of the portal vein—pylo-phlebitis—is not a very common disorder, yet cases do not unfrequently occur. It is associated with coagulation of the contents of the vein, either as a consequence or as a cause of the inflammation, the former being infinitely more rare than the latter. When a clot does form in the portal vein, it may be due to a variety of causes. There may be obstruction at the entrance of the vein into the liver from enlarged glands or cicatricial tissue or compression of it by such a condition as cirrhosis—either of which would tend to arrest the current of the blood; but more frequently we find a gradually developed clot arising by continuity from one developed in a radicle of the portal vein, such as may arise in the progress of ulceration of the stomach or intestines, suppurating piles, or splenic abscess. In pylo-phlebitis beginning in the wall of the vessel, the wall alters before the formation of the clot; but in either case the clot adheres

to the wall of the vessel, the adhesion beginning by thickening and cloudiness of the endothelium. After adhesion, the thrombus may gradually shrink and become absorbed, whilst the vessel becomes obliterated, and leave behind a new tissue, sometimes coloured by hæmatoidin from the blood clot. Perhaps more frequently the clot breaks down into a mass resembling pus, consisting mainly, however, of the remains of the clot mixed with some pus cells. In this way we may have many of the branches of the portal vein filled with this purulent-looking fluid, whilst both the finer branches and the main trunk leading to those so filled, are choked up with clot. In this way the lung avoids secondary infection. The substance of the liver does not so escape, however; abscesses form and jaundice is often brought about. The signs of a slight degree of adhesive inflammation—*i.e.*, affecting only small branches of the portal vein—are nil; but if we have the main vessel or any large branches so obliterated, we have signs resembling those of cirrhosis and leading to the same consequences. Jaundice is, however, more likely to occur. The disease progresses slowly, and ends like cirrhosis. In the suppurative form there is pain in the side, enlargement and tenderness of the liver, rigors, and jaundice. These symptoms are only of value, however, if we are able to assign any probable cause to them, as ulcer or abscess in any part of the portal circulation. If we have these together with some signs of portal obstruction, we may be able to diagnose the condition, but we cannot treat it. The two in fact may be said to so closely resemble cirrhosis and abscess of the liver as to demand the same treatment.

DISEASES OF THE BILE PASSAGES.

CATARRHAL INFLAMMATION OF THE BILE-DUCTS.

The bile-ducts from the points where they emerge from between the liver cells have a distinct epithelium of the cylindrical kind, and in the greater part of their course are furnished with walls of a complex structure. These, like other tubes lined with mucous membrane, are liable to catarrhal inflammation, with swelling and proliferation of the epithelium, which, as their diameter is not very great, and the propelling force which sends the bile onwards is weak, may easily lead to obstruction and con-

sequent jaundice. Most frequently this catarrh begins either in the liver or in the intestine—oftenest probably the latter. In the liver any of the causes of hyperæmia acting near the bile-ducts, may give rise to catarrhal inflammation of the tubes. This may happen both in diseases where jaundice is a common symptom, and again where it is rare. Thus it may happen with cancer of the liver, or with waxy liver, and in both be the cause of jaundice; but the jaundice so caused may be only temporary, and may speedily pass away, but if from the disease of the liver itself (cancer), it will probably be permanent. Another cause of inflammation which requires special discussion is gall-stones. The catarrh which spreads from the duodenum is always preceded by signs of gastric and duodenal catarrh. Hence we have all the symptoms of gastric catarrh—foul tongue, pain and flatulence after food, nausea and distension of the epigastrium, before we have signs of jaundice. This form of jaundice is most frequent in young people.

The appearances produced by catarrh of the bile-ducts are, as usual, thickening and softening of their walls with copious proliferation of epithelium. This is thrown off and mixed with the increased secretion of the mucous follicles which line the ducts and so gives the mucous secretion a milky or semi-purulent appearance. As this is thicker and more tenacious than usual, it tends to accumulate, particularly in that portion of the tube which runs in the wall of the intestine, and there acquiring more solidity by absorption of its watery particles, may form a plug which completely obstructs the passage. Hence it happens that even when the catarrh has subsided, the jaundice and enlargement of the liver may remain. The tube becomes distended from above the plug, or rather from above the intestine, backwards towards the liver, which in its turn enlarges, as does the gall-bladder, so that the latter may frequently be felt through the anterior wall of the abdomen as a smooth, rounded tumour. This is the only exception to the smoothness of outline which the enlarged liver shows, and helps to a correct diagnosis. There is also a feeling of weight and distension and some tenderness in marked cases over the liver, and the jaundice is always a marked and (up to a certain point) increasing phenomenon of the disease. During the same period the stools show no bile, and as the bile returns to them before the jaundice diminishes, the first show of colour in the motions is usually the first indication of returning health. The

urine throughout is highly pigmented, but when bile appears in the motions this speedily disappears, though the skin remains for a time more or less jaundiced. Sometimes, though rarely, the disease tends to become chronic; but it is always amenable to treatment.

Hence the *treatment* is eminently satisfactory. First we should endeavour to allay the gastric catarrh, by far the most frequent agent at the root of the mischief; and, as we have seen, there is nothing so good for this as alkaline salines in doses sufficient to act on the bowels and administered the first thing in the morning after a good long fast, —no food being taken after eight o'clock on the previous evening. If the patient can go to a foreign watering-place, Carlsbad and Marienbad are the best; but he can do quite as well at home. There is nothing better than a double salted seidlitz powder (containing three drachms of Rochelle salt) in hot water, to begin with in the morning as the first thing, to be followed during the day with ten-grain doses of pulv. rhei. co., or a mixture containing rhubarb, ginger, and bicarbonate of potash. Later, a light bitter with an alkali, as liquor potassæ; or, when a change is discovered, dilute nitro-muriatic acid is the best treatment. The liver itself needs little attention; if there be any pain, a warm poultice with a little laudanum on it will relieve it. More severe measures, as blisters and mustard poultices, or mustard papers, are seldom necessary.

GALL-STONES.

Gall-stones, or concretions formed by the elements of bile sometimes arise in the gall bladder, and their attempts at escape give rise to most formidable symptoms. So long as they lie quiet in the gall bladder there may be no indication of their existence, it is only when they begin to move or set up ulceration, that they seem to occasion mischief. Gall-stones are most frequent in people of middle age, who have led sedentary lives. They are also more common in women than in men, probably from the differences in their mode of life. The exact conditions which give rise to the growth of gall-stones are not well known, but they generally have a plug of mucus for a basis, and as such is more likely to occur in catarrh of the bile passages, the occurrence of such an inflammatory affection may have some influence on their production. However arising, gall-stones as we see them, are

bodies of low specific gravity, but sinking as a rule in water; when freshly passed or removed from the body, of a greasy feel, soft and crumbly; when dry, tending to break or split. Their colour varies, but as removed from the gall bladder the surface is usually darkened by bile. The colour of the substance of the concretion varies greatly, sometimes white, yellow, dark brown, or black; or again, composed of layers alternating in colour. The chief constituent of biliary calculi is usually cholestearin, and this sometimes presents a semi-crystalline arrangement, indicated mainly by radiating striæ; but if carbonate of lime be the chief constituent, the appearance is earthy, and the consistence is less. The colouring-matter found in gall-stones is that of altered bile. Neither biliverdin nor bilirubin is found as such, save on the surface, so that the colouring matters do not yield any marked reaction with nitric acid. Sometimes phosphates, particularly of lime, make part of the calculi, but not very often is this the case. The number and size of gall-stones vary greatly. They may be exceedingly small, form a kind of sand or grit, composed mainly of pigment, and at the same time exceedingly numerous. Again we may meet with only one large calculus filling and distending the gall bladder, and taking its shape, such may be as large as a hen's egg, and of a similar shape. Most frequently we find several. If there is only one it is, as a rule, smooth and rounded, but sometimes wrinkled, or slightly tuberculated; if several, they are facetted so that the one joins the other by a surface which might be compared to a joint.

In the great majority of cases there is no change seen in the gall bladder containing gall-stones, but sometimes we find signs of commencing irritation, which would doubtless, as it in so many instances does, have gone on to ulceration and perforation. Sometimes we see the ulceration fairly begun, particularly in the fundus and about the neck of the bladder. This may lead to closure of the cystic duct, with gradual absorption of the fluid contained in the gall bladder and shrinking of that organ round the inclosed calculi; or if suppuration has commenced in the gall bladder, we may have it filled with pus—a very rare event. In the liver itself calculi, chiefly pigmentary, may form, and set up inflammation, ending in abscess; and still more frequently we have ulceration of the large excretory ducts from arrest of the calculus in its progress outwards.

The signs of gall-stones on their way out are only too significant; as already said, they may remain in the gall bladder without exciting any unusual symptom. The most marked symptom of the passage of a gall-stone, "a fit of gall-stones," as it is called, is pain. True a small calculus may pass without giving rise to any particular symptom, but a large one gives rise to sudden, severe, and unexpected pain. Something has dislodged the gall-stone and its progress towards the intestine has begun. The dislodgment may be effected in various ways, but is most common after a meal, when the bile flows with unusual rapidity, or during exertion, when it is effected by the action of the abdominal muscles. The pain is generally referred to a well-defined region about the angle of the right scapula, or a little lower. It is also felt in front, but to a less degree, and may extend to the shoulder and right arm. The pain is of two kinds—a dull, gnawing, aching, and sickening pain; and a sharp, cutting or piercing pain (sometimes also boring or burning), which comes on in fits, the former being more or less constant. At first these attacks are relieved by pressure, but by-and-by a feeling of soreness manifests itself. This may develop into great tenderness when inflammation extending to the peritoneum has arisen. The pain is sometimes so great in these cases as to make men think well whether life is worth having at such a rate of suffering. It usually produces great exhaustion, the surface is covered with a cold sweat, the pulse is slow and scarcely perceptible. Sometimes the patient faints or goes into convulsions from the excess of pain; the former being favoured by the severe sympathetic vomiting, which is an almost invariable accompaniment of the malady. In a good many cases, especially if at all protracted, the vomiting tends to come on at a fixed hour, often in the evening, and inaugurating the attack of paroxysmal pain already spoken of. In such cases, too, we may have rigors at the same time, sometimes as regularly as in ague. As soon as the calculus has passed from the cystic duct into the ductus communis, obstruction to the flow of bile from the liver to the bowel begins, and consequently there is jaundice, which is not set up during the passage of the calculus through the cystic duct. Neither, indeed, does it of absolute necessity occur during the passage of the calculus to the intestine, for if angular, though it then excites more inflammatory mischief, it may leave room for

the passage of bile by its side, and so we may have both bile in the stools, and comparative or total absence of jaundice. Jaundice from gall-stones is rarely permanent; it sometimes lasts only for a few days, and if one stone follows another, as they are apt to do, we may have these attacks rapidly following on one another with intervals of complete ease. The subsequent passage of gall-stones is, however, apt to be facilitated by the passage of the first, which leaves the passage more or less dilated. Complete freedom from pain is not, however, an invariable consequence of the concretion reaching the intestine. Pain may still continue, and only abate gradually, and this would be probably still more frequently observed were it not for the comparative ease which the patient enjoys after his fearful torments. It is always satisfactory to discover the gall-stone which has caused the mischief, as a good deal may be learned from its appearance, especially as to the likelihood of another being in existence and the probability of its following; and so the stools should be carefully searched by diffusing them in water and passing them through a sieve. But very often even after severe bilious colic no gall-stone is found, perhaps owing to its slipping back into the gall-bladder, or its escaping from the bile ducts in another way. If it reach the intestine it sometimes is vomited up, sometimes passed by the bowel; but, as already pointed out, it may be arrested in the gut and give rise to obstruction and even to perforation. Sometimes gall-stones become impacted in the cystic duct, and we may have for a time all the symptoms of gall-stone colic without the jaundice, until these gradually cease with obliteration of the passage. Again, the gall-stones may give rise to inflammation, ending in ulceration either in the gall bladder, as already pointed out, or in the bile ducts. This may have very various terminations. If ulceration and perforation are completed without limiting peritonitis and adhesion, we have general peritonitis and death, the gall-stones escaping into the peritoneal cavity. But much more frequently adhesion has already taken place when the perforation is complete, and so no escape of bile or gall-stone occurs. But the ulcerative process may continue, and so we may have the gall-stone escaping in all sorts of directions, according as the ulceration has proceeded and adhesion taken place. In this way the calculus may reach the stomach and be vomited up, or it may reach the duodenum and be passed in the ordinary

way; but if of any size, it is much more likely to make its way directly from the gall-bladder into the colon, which, indeed, is the most common mode of escape where a large calculus is concerned. More rarely communications are effected with the urinary passages, the pleura, or the portal vein; or they may even escape externally, leaving a permanent biliary fistula communicating with the gall bladder.

Treatment.—The treatment of gall-stones is manifold, according to the purpose we desire to effect. First as the earliest notice we have of their existence is probably an attack of biliary colic, this demands primary attention. For this there is but one reliable remedy—opium. This should be given in full doses, but subcutaneously, as morphia-acetate, in quarter-grain doses, repeated as often as may be necessary to keep the patient fully under its influence. It is the physiological state of the patient which is the test of the quantity to be given in such cases. Next to opium comes heat; the warm bath externally as hot as the patient can bear it, and copious draughts of warm water internally will often relieve pain and spasms. No matter though these nauseate; the very nausea tends to relax the spasmodic grip of the bile ducts on the gall-stone, which is the chief cause of the pain. Next to these come chloral and chloroform; the former being given regularly, the latter as the fits occur. Both are of the greatest possible service. Belladonna and tobacco are also good. Belladonna may be given under the skin, as atropia in $\frac{1}{30}$-grain doses. Tobacco, to those who are not accustomed to smoking, may be used in a pipe; by those who are, it may be chewed. Nausea follows in most cases, but with the nausea comes ease. Hence it is, too, that we should not attempt to prevent the vomiting of food; rather let us wait to see how the attacks tend to recur, and to give food at the most suitable period. If the bowels are confined, we must give enemata of warm soap-and-water. Purgatives are harmful rather than otherwise. When the stone has passed, and its appearance indicates the existence of others, we should try to avert a second attack. Various plans have been recommended for getting rid of gall-stones under such conditions, but experience shows that none are so good as the use of the Carlsbad and Marienbad waters. The mode in which they act is unknown, but that they sometimes prove of good service is certain. If these are not attainable, alkaline-salines—particularly the citrate of potash, which is neutral

when swallowed, and can be long continued—should be persistently given. Of course it is best given effervescing, as bicarbonate of potass, with sugar and citric acid, flavoured to suit the taste with essential oils or bitters; or it may be made the vehicle for other remedies. Oil of turpentine, ether, and chloroform have all been recommended on theoretical grounds, but there is no good reason for believing in any special efficacy which they possess. We have high authority for recommending small doses of blue pill from time to time; and it stands to reason that the habits which generated the gall-stones should, as far as possible, be abandoned. When the calculus tends to make its way out from the bile passages by unusual routes, we can only treat symptoms as they arise.

DISEASES OF THE SPLEEN.

HYPERÆMIA AND CONGESTION OF THE SPLEEN.

From its structure and relations the quantity of blood in the spleen varies very greatly within physiological limits. Thus the organ is always greatly enlarged during intestinal digestion, the cause of which is probably twofold. The other branches of the portal vein are then more distended than usual, and so there is greater pressure to be overcome by the blood emerging from the splenic vein. Then, too, in all probability the function of the spleen is particularly concerned with the new materials introduced by the process of digestion, and so the quantity of blood sent to it is greater.

In all acute febrile disorders we have enlargement of the spleen. Such are especially manifest in typhus and typhoid, the various exanthemata, intermittent and remittent fevers, and in septicæmia and pyæmia. In all of these there is marked enlargement, especially in the malarious fevers, where undoubtedly there is some connexion between the enlarged spleen, and the cold surface due to contracted vessels, and the concurrent high temperature. We may have, however, both enlarged spleen and enlarged liver from what we call malaria without any distinct attack of fever. This is well seen in India. But the influence of periodic intensity of cold, especially at night, is well worth bearing in mind as associated with this. The congestive form of splenic

derangement is seen in all forms of portal obstruction, especially those connected with the liver; less so in those connected with the lungs and heart.

The appearance of the spleen in such circumstances varies very greatly. In the acute fevers above mentioned, though large, it is soft, black and almost diffluent. So too is it in remittent and intermittent fevers during an acute attack. But when the malarious influences have lasted any length of time, it is large, but its surface is wrinkled, and it becomes hard from development of connective tissue in its trabeculæ, and black from the presence of altered blood in the new tissue. The primary enlargement is due entirely to increased proliferation of the splenic corpuscles and to influx of blood.

Acute splenic enlargement from hyperæmia can hardly be said to be indicated by any local, save objective, signs: very rarely, except on hard and deep pressure, is there any manifestation of tenderness, still less frequently of pain. Physical examination, however, shows an enlargement, which, in the case of malarious fevers, is sometimes very great, reaching far below the margin of the ribs, a boundary seldom transcended in ordinary cases. It may also extend upwards, higher than the eleventh rib, its customary boundary as indicated by percussion, particularly if there be also flatulent distension. When the spleen grows downwards it tends to grow towards the umbilicus, but if larger and heavier than usual its weight drags it down more directly to the pelvis, and there remains immovable with respiration.

The *treatment* of this form of splenic enlargement in the acute stage is simply that of the disease occasioning it. If malarious, we give quinine in large doses, and promptly the fever ceases and the spleen decreases. But the anæmia always associated with such cases, and the diminution of the spleen itself, is greatly benefited by the use of iron. Recently the use of the cold douche has been employed for the diminution of the spleen in acute enlargement of its substance.

CHRONIC ENLARGEMENT OF THE SPLEEN.

The causes of acute enlargement of the spleen may also give rise to the same thing in a persistent fashion. The various kinds of malarious disease and cirrhosis of the liver frequently occasion it. In the former, men some-

times have enormous spleens, partly due to increase in the lenticular substance, partly and much more so to increase of the spleen pulp. In leukæmia we have the same kind of enlargement, which is sometimes so great that the spleen weighs several pounds. Both spleen pulp and its connective tissue are here increased in quantity, but the tissue elements seem to have undergone no change, save that they are more closely packed together. The capsule is often thickened and adherent. In both forms the size and weight may be something enormous. On section the spleen pulp is red in colour, and fleshy in consistence, with abundant deeply pigmented spots in the malarial form.

In ordinary enlargement of the spleen there may be little interference with the general health, for the enlargement, especially in malarious districts, may exist without much sign, or long after the exciting cause is past. But usually such individuals are earthy-looking or pallid in complexion, and they are unusually dull and feeble. Nutrition is imperfect and the blood impoverished for want of a due supply of red corpuscles. Hence too they are both short-breathed for want of oxygen-carriers in the shape of red blood corpuscles, and have a tendency to bleeding, which cannot easily be restrained, from impoverished blood. Epistaxis is common, and swelling of the legs from hydræmia also frequent. In leukæmia we may have the blood so altered that one-half of the corpuscles are white, instead of only seeing one in the field of the microscope; and yet the total number of formed elements is less than in health. Thus the blood will hardly coagulate, or if it does, forms peculiar speckled masses: For this reason even bleedings from slight causes are prone to prove fatal, for there are no means of arresting the flow. It is important not to confound this condition with that sometimes called lymph-adenoma, where a similar kind of change seems to take place in the lymphatics and spleen, and to spread to other organs containing lymphatic tissue, in a semi-malignant fashion; but in it there is no increase in number of the white blood corpuscles. None of these conditions have as yet been perfectly studied, and our knowledge regarding them all is imperfect.

The *treatment* of the enlarged spleen of malarious disease is much more satisfactory than that of enlargement from other causes. It consists in the giving of full doses of Peruvian bark, or, better, its alkaloid, quinine, or

cinchonine (ten to twenty grains for a dose three times a day); whilst iron should be freely administered either as chloride or iodide. If the former, it may be combined with chloride of ammonium or iodide of potassium. Locally the best application is the ointment of the scarlet iodide of mercury, rubbed thoroughly well into the side before the fire or in the warm rays of the sun. The two modes of treatment taken together are followed by the best results, especially if accompanied by a change of climate. In the other forms of enlargement no satisfactory remedy is known, and we must do our best to combat symptoms. Quinine and iron promise the best results.

WAXY, OR AMYLOID SPLEEN.

The spleen is very often the seat of waxy or amyloid degeneration. This begins as usual in the vessels, where they exist, but early attacks the cellular elements of the organ. The changes are similar to those which occur in the liver and kidneys. It arises under similar conditions as in liver disease, *i.e.*, in tertiary syphilis, and in all chronic diseases with suppuration, &c. It also is seen in malarial spleens. Very often though we see in constitutional syphilis a condition similar to that in the liver, which is described as due to what is called peri-hepatitis, then under the capsule of the spleen is seen a whitish semi-transparent mass, sometimes called albuminoid. The true waxy spleen is large and heavy as well as hard and friable. It contains little blood, and its colour inclines to violet. The cut surface is smooth and shining, and from the deficiency of blood comparatively dry. The parts apt to be specially affected are the Malpighian bodies, and these only may be affected when the spleen is but slightly enlarged. Then they appear as whitish rounded gelatinous masses of no great size, and readily yield the so-called amyloid reaction. The cells, when examined, are found altered, and their contents pale and semi-transparent. The symptoms of such a condition are chiefly anæmia and a tendency to hæmorrhage as well as to dropsy about the ankles. The diagnosis from the former condition mainly depends on the implication of other organs, especially the liver and kidneys, whilst the—

Treatment resolves itself into that of the condition producing it, which being improved, we may hope for improvement in the condition of the spleen.

HÆMORRHAGIC INFARCTION OF THE SPLEEN.

The spleen is unusually prone to embolism. Its artery is large, and the current through the spleen is quick, and so any embolus in the aorta is unusually apt to be carried thither. Fibrinous coagula from diseased valves, or the products of ulcerative endocarditis, are thus most likely to find their way into the spleen. Sometimes, but rarely, the infarcts may come from the lungs. In some maladies, like malarial poisoning and septicæmia, we may find the blood forming clots in the spleen, the exact mechanism of their origin being unknown. These infarctions are usually of some size. At first dark brown and hard, they afterwards become yellow and fibroid. They may occasionally undergo degeneration or absorption, but sometimes become purulent, especially when there are many small infarcts. In many cases such a condition of spleen is not discovered during life, but if with heart disease we have signs of acute change in the spleen, we may justly conclude that infarction has taken place. The local signs are pain, tenderness, and enlargement of the spleen, very often accompanied by vomiting, sometimes with rigors or chills. Even suppuration can rarely be made out during life, and the whole phenomena must, as a rule, be read backwards by the light of the post-mortem to the symptoms during life.

Treatment here is of no avail. If there is much pain, which is rare, we give opium, apply poultices or mustard papers, give ice for the vomiting, and if we can make out an abscess, empty it by the aspirator; but too often even our diagnosis is post-mortem.

DISEASES OF THE ORGANS OF CIRCULATION.

DISEASES OF THE HEART AND ITS APPENDAGES.

PERICARDITIS.

Pericarditis as a simple idiopathic affection can hardly be said to exist. Nevertheless, as in the case of pleurisy, where we frequently encounter adhesions as to the origin of which no history whatever is attainable, so of pericarditis.

The malady has, as a rule, either a traumatic origin from wounds, blows, and the like, or it spreads from adjacent organs, as the lung and pleura; but most frequently it occurs as a complication or part of rheumatism and Bright's disease. It may also appear in certain acute diseases, as small-pox, pyæmia, and scarlatina, and may terminate certain chronic maladies, as phthisis.

The malady hardly existing separately, its course cannot well be described. Its usual history is that it comes on in the course of rheumatism, and though perhaps more frequent in severe cases of the disease, may occur in those where the joint symptoms are slight. In hospital practice it most frequently happens that the pericarditis is already developed before the admission of the patient or very shortly afterwards, and (contrary statements notwithstanding) it does not raise the temperature. Pericarditis may keep up a high temperature, but it is rare indeed to find any indication of its onset in the temperature chart. The most frequent signs of the existence of pericarditis are pain and distress about the region of the heart, and tumultuous action of the organ. Pain is, however, an uncertain sign; it is very often absent but may be excessive. It is most marked in the epigastrium, and is usually aggravated by pressure there. This may be due to diaphragmatic pleurisy. Palpitation, too, though of frequent occurrence, is not invariably present, and there may be considerable irregularity of the heart's beat without the patient being at all aware of it. Sometimes there is no alteration in the heart's action, though the pulse is commonly

quickened. Owing to the primary disease, on the other hand, the pulse may be diminished in frequency, whilst in a very considerable number of cases, it becomes markedly irregular both in force and frequency. In some cases there is dyspnœa, due to imperfect circulation in the lung, but this also is a very variable symptom. In some instances there is a kind of maniacal excitement, and delirium is always common.

In pericarditis we may find inflammatory changes in some parts of the structure only, or it may be universal. At first the pericardium is more or less reddened, and it may be shows spots of hæmorrhage; the surface is dull, owing to shedding of the epithelium, and proliferation in the substance of the membrane. Soon the membrane assumes a roughened or shaggy appearance, and exudation, as it is called, occurs. This exudation is partly solid, partly fluid, the solid portion being deposited in layers on the surface of the pericardium—most frequently on both the visceral and parietal surfaces, and often this assumes a villous, honeycomb, or lace-like appearance. The fluid portion contains few cell-forms, and is usually of a clear straw yellow colour and quite transparent. In this flakes of lymph sometimes float, or more rarely the cell-forms are so abundant as to give the fluid a purulent character. The quantity of fluid varies exceedingly, sometimes only a few ounces, sometimes pounds. Occasionally it is mixed with blood, but seldom in any considerable quantity. This originates in rupture of the capillaries in the new growth. A perfectly purulent effusion is very rare, save in pyæmia.

Now, as a consequence of these local changes, certain physical signs manifest themselves. While as yet there is only roughening of the surface, we elicit a friction sound coincident with the movements of the heart. These are *superadded* to the heart sounds, and not perhaps exactly synchronous with them. Later, when there is exudation of fluid, the friction sound may continue, or even become exaggerated, for no amount of fluid of necessity removes these sounds, as in pleurisy. If the fluid be at all abundant, we may elicit percussion signs of value. The area of dulness is then increased in size and altered in shape, becoming pyramidal, the base next the diaphragm. The extension of such dulness outside the apex beat and above the third rib, is a sign of very great value. Inspection at this stage shows in some cases a bulging, especially in young patients. Palpation shows weakening of the heart's impulse, a

shifting of the apex beat outwards and upwards, and occasionally a sensation of friction. Besides the friction sound already alluded to, auscultation shows the heart's action to be irregular and weaker than usual, the sounds being more or less muffled; but as endocarditis co-exists in the majority of cases, we may also find modifications of the sounds themselves.

In most cases pericarditis ends in recovery. The fluid is gradually absorbed and the two sides are brought together, so as to cause adhesion, if, as is most frequently the case, the two opposite sides have been affected. In this case the wavy irregular motion of the heart gradually disappears, and if the friction sound has disappeared, it too comes back again, especially at the base. Dulness disappears from above downwards, and the usual sounds are more plainly made out. Death sometimes occurs; if so, most probably from syncope, the fluid interfering with the motion of the heart. In cases with purulent effusion death results from constitutional causes. The fact that the muscular tissue of the heart is often implicated in the disease (myocarditis) naturally favours death from syncope. Death may ensue speedily, or be put off for weeks. Even at the best, recovery from pericarditis is rather slow, and in some cases it tends to pass into a kind of chronic form which exhausts the patient.

Treatment.—Pericarditis is one of the few inflammatory maladies in which blood-letting is still in vogue as a means of treatment. It is, however, rare that general blood-letting is employed. Leeches or cupping-glasses are the means employed, and they are especially useful for relieving pain when that is severe. But it is only in rheumatic or traumatic cases that such procedure is admissible; in the latent pericarditis of Bright's disease it is not to be thought of. The ordinary treatment consists of poultices and flying blisters applied over the heart, and these certainly relieve the pain very greatly. Some prefer ice and cold compresses, but most English authorities adhere to the former plan. Alkalies too, as the common mode of treating rheumatism, should be employed, but not too freely. Opium is a remedy of great value in these cases, though, for some reason, people seem prejudiced against it; and no doubt a thick belladonna plaster, or extract of belladonna reduced with glycerine smeared over the precordia sometimes suits better. In many cases where there is much disquietude the best thing is a dose of morphia hypodermically. The exact value of

chloral has yet to be tested. When fluid has accumulated in large quantity, it should be evacuated by aspiration, care being taken to prevent injury to the heart itself. To this end either a trocar and canula as fine as possible should be employed, or the hollow needle should itself be protected by a canula. Pericardial effusion in Bright's disease is too often the last phase of that malady to encourage one to take any very active measures for its treatment. In that form, the effusion is rather dropsy (hydropericardium) than anything else, and diuretics or direct removal promise best.

Adhesion of the pericardium to the walls of the heart is, as already seen, the most common sequel to pericarditis. The fact that it is so indicates that, though to be strenuously avoided, it is not an immediately dangerous matter. Later, however, in the history of the malady dilatation and hypertrophy of the heart and degenerative changes in its structure may occur as its consequences. Its best sign is retraction of the chest walls, especially of the intercostal spaces, during the ventricular systole. Such adhesions, if at all rigid, materially interfere with the propulsive power of the heart.

ENDOCARDITIS.

As in the case of pericarditis, so as regards the inflammation of the lining membrane of the heart, we find that it is most frequent as a part of the rheumatic process. We do, however, not unfrequently find cases of heart disease, probably from endocarditis, but where no history of rheumatism can be made out. The malady may also occur in the course of chronic Bright's disease, or as a complication of some febrile disorders, especially measles and scarlatina. When attacked, the parts that suffer most are the valves and chordæ tendineæ, it has been supposed because greater stress habitually falls on these parts than on any other. All cases, however, of endocardial murmur occurring during the course of rheumatic fever, especially if accompanied with chorea, are not due to inflammation, but apparently to irregular muscular action, resulting in imperfect closure of the valves. Valvular imperfection already in existence seems to favour a subsequent attack of endocarditis, though it can hardly be said to act as a direct cause of such inflammation.

As in the instance of pericarditis, the history of a simple,

uncomplicated case of endocarditis can hardly be written, seeing that such rarely, if ever, occurs. Even rheumatic endocarditis may come on insidiously: there may be no pain, and very little discomfort, beyond a little irregularity of action, which can hardly be called palpitation, and some quickening to a varying amount. The infiltration of the muscular walls of the organ with serum, or myocarditis probably acts as the cause of any impaired power in the heart-stroke which may exist, and this diminution of power may be great enough to cause dyspnœa. But the disease may be wholly latent, and its effects only make themselves known in after years. Sometimes death may result, but not very often. If so, accumulation of the inflammatory products at one of the orifices, or the breaking of one of the chordæ tendineæ by softening of its substance may be the means of bringing it about. Yet complete recovery from endocarditis is rare: if the valves be affected, sooner or later, with or without subsequent attacks, puckering or shrinking of their substance follows, with all the mischiefs of imperfect valvular action in their train.

In adult life, whatever be the rule during fœtal existence, the left side of the heart is alone attacked. The first sign of change is probably redness, but of this, as death at such stage is rare, we can hardly be sure; but speedily the membrane becomes rougher and thicker than usual, especially at certain spots on its surface. Villi, as they are called, or small papillæ form, composed partly of fine connective tissue, partly of undifferentiated cell forms. These are especially apt to form on the margin of a valve, giving it a fringe-like character. Such outgrowths are also called vegetations, and are composed partly of inflammatory products from the endocardium, and partly of fibrin itself, mixed, it may be, with some white corpuscles, from the blood. Later the altered portions of endocardium undergo change, hardening and contracting, and thus deforming the valves, as already mentioned. From infiltration of their substance with inflammatory products, the chordæ tendineæ sometimes give way, and for a similar reason the substance of the valves, especially the semilunars, may also give way. Some of the forms of aneurism of the heart's wall may be the result of a similar accident to the endocardium elsewhere than over the valves. Ulcerative endocarditis is not common; both in it and the condition just described, we have myocarditis as well as endocarditis, and so softening, with more or less infiltration, of the muscular substance. Another source

of danger is embolism; the masses of fibrin deposited on the edges of the roughened valves may be washed away, and give rise to mischief elsewhere. Most frequently the spleen is thus implicated, but the liver and kidneys may be so also, and often we have brain mischief from blocking of a cerebral artery. In most cases such blocking is only followed by arrest of the function of the part directly supplied by the vessel, but if the embolus contain putrescent material a pyæmic abscess is set up. Such, however, is not commonly the case. Of course embolism of a cerebral artery, if the vessel be of any considerable size, will in all probability be followed by paralysis; it may be by death.

But if the constitutional symptoms which accompany these changes be badly defined, the physical signs arising therefrom are usually well marked. In the first place, the heart's impulse is somewhat exaggerated, but if its substance be affected the contractions are inefficient and the pulse small. If, during the course of the malady, there arise from any cause sufficient obstruction on the left side to materially interfere with the flow of blood, the right side will become dilated and the percussion dulness on that side extend outwards. If the valves be affected, the mode in which they are likely to suffer will be, on the part of the aortic valves, by roughening of their surface—giving rise to a systolic sound which we may call aortic obstructive; and on the part of the mitral imperfect adaptation, giving rise also to a systolic sound from mitral regurgitation. Owing to the peculiar construction of the aortic valves, incompetency is less likely to follow until shrinking has taken place, although the roughening may be so great as to give rise to both a systolic and a diastolic sound from obstruction and regurgitation. Such diastolic bruit too may be produced by rupture of the semilunar valves, as already explained, just as we may find mitral regurgitation due to the breaking of one or more chordæ tendineæ.

Treatment.—Any attempts to treat endocarditis are singularly unsatisfactory. In pericarditis we may hope to be of some use, and we may try the same remedies here, but in effect we are reduced to wait and allow the disease to take its course. Over the subsequent affections of the valves we have some control, but over the inflammatory process, which gives rise to them, little or none. If there be pain, that is most likely due to pericarditis, and should be treated accordingly. Alkalies and morphia subcutaneously constitute the basis of our treatment.

MYOCARDITIS, OR CARDITIS.

Inflammation of the heart's substance is now admitted to be a frequent complication of pericarditis and of endocarditis, especially when the two are combined. Under such circumstances we usually find that only isolated portions of the heart's substance are affected. These patches may be either immediately beneath the pericardium or beneath the endocardium, and either due to direct extension of inflammatory mischief from these; or they may occur independently. In the early stage we find the tissues softened and sometimes infiltrated with the products of inflammation, but later we may find that these have disappeared, leaving behind a scar-like substance.

As to the symptoms of myocarditis we can hardly speak, but if the heart's action becomes quickened and at the same time weakened and irregular, with or without the presence of signs of endo- or pericarditis, we may venture to suggest the existence of myocarditis, but we can hardly call such a guess a diagnosis.

The most common seat of myocarditis is the apex of the left ventricle, but it may also occur in the septum. If associated with softening of the endocardium, it may result in rupture and aneurism of the heart's substance, whilst subsequent changes in the inflammatory products may give rise to another form of aneurism of a distinctly chronic kind, the former being markedly acute. Abscess is not so frequent a termination as is simple softening. If it does occur, it very probably depends on septic products carried by the circulation into the substance of the heart. These abscesses usually burst, and may give rise to communications between different chambers of the heart, or may open by rupture or perforation into the pericardium.

If we cannot diagnose, we can hardly lay down rules for the *treatment* of myocarditis. Symptoms must be dealt with as they arise.

DEGENERATION.

Besides inflammatory change, the heart is liable to a variety of alterations, all more or less of the nature of degeneration. In all febrile disorders with high temperature we find the heart, like other internal organs, espe-

cially the spleen, softened, which helps to account for its feeble expulsive efforts in the latter stages of such diseases; but its most important change in this respect is that due to fatty degeneration. This is of two kinds: one, the deposition of fat between the muscular fibres, such as occurs in all over-fed individuals; and that more serious fatty degeneration where the fibrils lose their striæ and break down into a fatty granular mass. In the former instance the fat may be deposited at the expense of the muscular fibrils, but it does not necessarily destroy them. It may, however, diminish their number by mere displacement, and will certainly if in any abundance interfere with the heart's action, and so help to give rise to the breathlessness such patients always suffer from. True fatty degeneration is a more serious matter: it involves certain tracts, particularly the columnæ carneæ, giving them the appearance of faded leaves. But it hardly ever exists alone; we find signs of fatty degeneration elsewhere, such as arcus senilis, flabby muscles, and degenerated vessels. With these we have a feeble impulse and a slow and feeble pulse, together with other marks of impaired circulation, particularly a tendency to faintness, and loss of mental power. Still another variety of degeneration is the pseudo-hypertrophy where connective tissue replaces muscle.

Treatment.—The simple debility and softening of acute disease are to be dealt with on ordinary principles. Good food, fresh air, strengthening remedies, and not too much work are specially important features in the treatment of all heart diseases. In fatty heart from deposition the same means should be employed to remove the fatty deposit as from other parts—that is to say, a duly regulated diet and moderate exercise. The waters of Carlsbad and Marienbad are recommended for such cases. In the case of true fatty degeneration we should feed the patient well, but carefully; give him a moderate supply of stimulant, enjoin regular exercise in a bracing climate, but to carefully abstain from sudden exertion, mental worry, or shock, and to live a life regulated by rule and measure if he desires to escape sudden death. As far as medicine goes, strychnine and iron are most likely to do good. For fainting attacks, ammonia to the nose and given internally is the best remedy.

DISEASES OF THE VALVES AND ORIFICES OF THE HEART.

The proper function of the valves interposed in the course of the circulation being to regulate the direction of the blood flow and so to utilize as far as possible the forces concerned in the propulsion of the blood, any imperfection which causes them to fail in this work must be of grave importance. Such interference is usually one or other of two kinds; either the valvular orifice becomes *narrowed*, and so there is *obstruction* to the onward flow of the blood, or the valves are unable, even when closed, to occlude the orifice, so that *regurgitation* follows—in other words, the valves are *incompetent*.

Any one of the heart's orifices and its valves may be the seat of obstruction and regurgitation; but practically, whilst regurgitation may occur at all of them, simple obstruction is rare at the mitral orifice, almost unknown at the tricuspid, and though a sound which might be taken as indicative of the existence of obstruction at the pulmonary orifice is common enough, it is not in all probability due to any actual obstruction to the blood flow. Then again, whereas the valvular diseases on the left side are mainly due to endocarditis, those on the right are usually the result of overstretching and dilatation merely. From endocarditis and atheroma come valvular mischief, from permanent over-distension comes dilatation, and from obstruction to the blood flow of any kind, if permanent, comes hypertrophy.

AORTIC DISEASE.

In tracing the evil consequences of valvular mischief, we must always trace the blood current backwards, and for this reason altogether apart from their relative frequency, we place diseases of the aortic orifice and its valves first on our list.

Aortic disease is of two kinds—*obstructive* and *regurgitant*. Aortic obstruction is most frequently due to some change in the valve itself, whereby it becomes more rigid, or presents some rough point or surface constituting an obstacle to the current of the blood. Such may be the results of atheroma or endocarditis. Contraction of the orifice itself is less frequent, but may occur. Aortic insufficiency is most frequently due to valvular changes,

directly or indirectly the product of endocarditis, resulting in shrinking and thickening, or adhesion; sometimes, but more rarely, it originates in rupture. Thus, in the main, the causes of narrowing (*stenosis*) or obstruction, are also the causes of insufficiency, and hence we most frequently find the two associated, especially in the advanced stages of the malady.

AORTIC OBSTRUCTION.

Simple aortic stenosis is not very common; in it there is obstruction to the outflow of blood from the left ventricle, but the valve action is complete, and there is no regurgitation. Hence, if we listen over the base of the heart, where the aorta is nearest the surface, which is over the mid-sternum opposite the third interspace, or just where the fourth right costal cartilage joins the sternum, we hear a bruit which takes the place of the first sound. This bruit is transmitted upwards along the course of the aorta, but is commonly lost if traced towards the apex of the heart. The second sound in pure stenosis is unaltered, but, as already said, narrowing and insufficiency commonly go hand in hand. Such a bruit is, however, by no means a certain sign of aortic disease; it may be due to relaxation of the aorta beyond, and to anæmia. Hence to show that this bruit is due to actual narrowing, we must seek for other signs. Chief among these is the hypertrophy of the left ventricle, which obstruction induces. The left heart becomes larger, stronger, and slightly more capacious than normal, and hence the apex beat is outside the nipple, and is unusually strong and heaving in character. But withal the pulse is small, for the blood does not flow freely enough through the aortic opening to produce a large pulse wave, though what it lacks in size, it makes up for in strength and hardness.

AORTIC REGURGITATION.

In aortic insufficiency, listening at the same spot as before we hear a bruit not systolic or taking the place of the first sound, but markedly diastolic, superseding the second sound and coming promptly after the ventricular systole. This bruit differs from the former in that it is conducted downwards towards the apex of the heart, and along the sternum, as well as upwards along the course of the aorta. The regurgitant current carries with it the

bruit in the downward direction, as the onward current carries the murmur of obstruction upwards. Hence arises in such cases the great importance of tracing the sounds to their origin, or we might take a basic sound to be an apical one. The bruit is usually blowing in character, though this is a point of no importance, and occupies more time than the second sound should. With this bruit the first sound may be natural.

As a consequence of regurgitation, the blood which the contraction of the ventricle has driven into the aorta, no longer flows in one direction, *i.e.*, onwards into the arteries; it flows backwards into the ventricle as well. Hence two things follow—first, the arteries are not well enough filled; whereas secondly, the ventricle receiving the usual quantity of blood from the auricle, as well as the back-flow from the aorta, is over-filled, and permanent over-distension follows. In a good many cases this is partly made up for by increased growth of muscle in the walls of the ventricle, *i.e.*, hypertrophy, so that dilatation and compensatory hypertrophy go hand in hand. But in others there is little or no compensatory hypertrophy. Now the blood being driven into the aorta with more force than usual, and there being no obstruction, the pulse wave is large and full; but the recoil of the aorta drives the blood backwards as well as onwards, and hence the tension of the arterial system promptly falls when the ventricular systole is over. Accordingly with aortic regurgitation we have a pulse full and strong while it lasts, but promptly collapsing, so that it has acquired the name of the "water hammer" pulse from the toy of that name. The pulse too is delayed, for the vessels are not full and tense, but half empty, and unusually tortuous, so that the pulse travels slowly. If there be no compensatory hypertrophy, this is still more markedly the case. With compensatory hypertrophy, however, the subject of aortic regurgitation may long display the signs of perfect health. There may be some palpitation and some breathlessness on exertion, but beyond that nothing. Sooner or later, however, this condition ceases; hypertrophy no longer keeps pace with dilatation; and the arteries are less and less filled till the patient becomes intensely anæmic. As the dilatation proceeds, the auriculo-ventricular orifice shares in it, and mitral regurgitation sets in. This, of course, may occur much earlier in the history of the disease when the aortic and mitral valves are affected simultaneously

or soon after one another. With mitral regurgitation a new set of phenomena develope themselves, the ventricle being partly filled from the aorta as well as from the auricle, there will be a tendency to over-accumulation of blood in the auricle and in the lungs, leading to pulmonary congestion and hæmoptysis. Death is most frequently brought about as the result of mitral regurgitation, but may happen from a sudden faint, owing to imperfect blood supply to the brain.

MITRAL REGURGITATION.

The auriculo-ventricular orifice on the left side may become abnormal either by narrowing (stenosis), or by imperfection due to widening of its orifice or insufficiency of its valves. As the first is a totally independent malady, whilst insufficiency may result from aortic disease, we shall here deal with insufficiency giving rise to regurgitation only. Most frequently mitral disease is due to endocarditis which has caused shortening and puckering of the valves, or shortening or breakage of one or more of the tendinous chords. Sometimes thick plates of connective tissue or calcareous matter are found in the substance of the valve. However brought about, if the valves close the auriculo-ventricular orifice imperfectly, whenever the ventricle comes to contract, part of the blood, which should be driven into the aorta, passes backwards with more or less force into the auricle, and this continues during the greater part of the ventricular systole. Hence the aorta is imperfectly filled, and the auricle overfilled. As the vibration of the closed mitral valves is the main cause of the normal systolic sound of the heart, and as the backward motion of a mass of blood through an orifice in or between these valves must materially interfere with this vibration, to say nothing of changes in the valves themselves, we find the normal first sound modified, and converted into a bruit. Such bruit, we hear where the left ventricle is nearest the surface, just where the apex which is formed by the left ventricle comes in contact with the chest-wall. When there is much hypertrophy and the apex does not reach the chest, we hear it just above the apex, thence extending backwards towards the left axilla, as the left ventricle is also the posterior one. But this sound is not propagated either to the right side or to the base of the heart—*i.e.*, in the direction of the normal blood current. Such an ab-

normal sound in such a situation is almost invariably a sign of mitral insufficiency of a permanent character, but in some cases it may be due to imperfect co-ordination of the papillary muscles; certain it is, at all events, that such bruits may absolutely disappear.

As a consequence of this backward as well as onward flow of the blood, we have an over-filling of the auricle, and an insufficient filling of the aorta. Hence the second aortic sound is not so sharp nor so loud as usual, and the arteries being imperfectly filled, the pulse is smaller than usual, sometimes regular, but oftener irregular. Especially is this the case when there is much dilatation and the heart beats rapidly and imperfectly, as an unskilled swimmer beats the water, then the pulse becomes utterly irregular, and what appears to be intermittent, since the effects of some ventricular contractions are not propagated into the radial arteries at all.

But why should there be dilatation? For it is a clinical fact that in most cases we do have both dilatation and some degree of hypertrophy on the left side in mitral regurgitation. The portion of blood driven backwards during ventricular systole must over-fill the auricle and distend the pulmonary vessels already full from the blood ejected by the right ventricle. When, therefore, there is no mitral narrowing, the blood flows with increased force and in increased quantity from the auricle into the ventricle during its diastole, so that the latter is over-filled, and habitual over-filling ends in permanent distension. Moreover, over-filling of the ventricle is favourable to arterial circulation, inasmuch as, even allowing for the portion driven backwards into the auricle, a quantity nearer the normal amount is injected into the aorta at each beat. But this of course requires increased propulsive strength on the part of the ventricle, and so we have with the dilatation usually some hypertrophy. Such hypertrophy is therefore a conservative process. To ascertain the real evil effects of mitral regurgitation, we must follow the blood current backwards. Then we see that the left auricle becomes dilated and generally also hypertrophied, whilst the pulmonary vessels are habitually over-filled. This, as usual, gives rise to important alterations. Normal circulation is as necessary as a proper amount of air for comfortable breathing, and hence in such patients breathlessness is a marked feature. This breathlessness is always aggravated by exertion, for then the heart beats quicker, and as with each stroke some

blood is sent backwards as well as onwards, the accumulation in the lung proceeds at a rapid pace. As the vessels so concerned are the pulmonary, not the bronchial, bronchial catarrh is not so common as pulmonary œdema. So that though there is cough and expectoration, the latter is generally watery, and if there be much congestion bloody. As increased force is necessary to drive the blood onwards through the lung as well as to resist the backward current from the left ventricle, we usually find the right ventricle hypertrophied to some extent. This, however, is most common in the young; too often we find only dilatation instead of hypertrophy, and almost always dilatation with the hypertrophy. Pure hypertrophy of the right ventricle is most frequent with mitral obstruction. So too is a sign sometimes associated with mitral regurgitation—viz., increased loudness and sharpness of the pulmonary second sound.

Sooner or later, however, the tricuspid orifice dilates, its valves become incompetent, and so with each stroke of the right ventricle we have regurgitation on the right as well as on the left side. As a consequence of this we have venous obstruction and venous pulsation in both the superior and inferior cavæ; the obstruction is commonly more marked in the inferior, the pulsation in the superior cava and the great vessels, especially the jugulars, joining it. Hence too the face becomes engorged and purple, the lips blue, and headache is complained of.

Worse results follow venous congestion in the lower cava: the liver becomes congested and enlarged, so that it sometimes reaches as low as the navel. Occasionally there may be felt a distinct heaving impulse in the liver synchronous with that of the right heart, and dependent on backward flow from it into the cava and hepatic veins. The secretion and formation of bile are also interfered with by the congestion, and there may be some degree of jaundice, especially of the conjunctivæ. From this obstruction too follows congestion of the stomach and bowels with impaired digestion, intestinal catarrh, and very often hæmorrhoids. The kidneys also suffer from the venous congestion; so that we may find albumen in the urine, and casts of various kinds. But sooner or later another symptom shows itself—that is dropsy. The fluid effused from the smaller vessels for the nutrition of the part is not reabsorbed, or there is direct effusion from the veins; and as the blood is imperfectly nourished owing to the condition of the portal system, it becomes more

watery and its serum more readily effused. This fluid accumulates, especially where the blood current is slowest and the tissues loosest—*i.e.*, in the lower extremities, which soon begin to pit on pressure—they become œdematous. This œdema gradually extends upwards, till the thighs are affected. Thence the fluid spreads upwards in two ways: the cavity of the peritoneum fills—this we call *ascites*—whilst some accumulates in the walls of the abdomen, which, together with similar accumulations elsewhere in the subcutaneous connective tissue, we term *anasarca*. The last developments of this fluid accumulation are generally hydrothorax and hydropericardium, which, together with the growing œdema of the lung from the congestion of the pulmonary system, commonly end the scene. Years may, however, intervene between the first slight œdema of the ankles and this last dropsical development, and sometimes intercurrent maladies carry off the patient, but the end invariably comes, sooner or later. *Hæret lateri lethalis arundo* is true as ever of most organic and valvular diseases. Fortunately this is true no longer of functional mischief; hence the great importance of diagnosing the two.

As a good broad rule it may be said that direct or obstructive diseases are less immediately dangerous than the indirect or regurgitant maladies.

PULMONARY REGURGITATION.

Pulmonary regurgitation may be not uncommon; but this is certain, that the bruit, corresponding with that of aortic regurgitation, which should be heard over the third left costal cartilage, *i.e.*, at the pulmonary orifice, is exceedingly rare.

TRICUSPID REGURGITATION.

Tricuspid regurgitation is common enough, seeing that this is the direct consequence of a good many pulmonary diseases, especially emphysema as well as of mitral disease. It is not always marked by a bruit, but when that exists it is best heard over the ensiform cartilage, and is inaudible over the left apex. A sign of tricuspid regurgitation of greater frequency and certainty, is distension and pulsation of the jugulars not communicated from the carotids, but transmitted backwards, the

vessels also filling from below, when the valves have given way. Tricuspid regurgitation is invariably accompanied by signs of over-distension and dilatation of the right side, hence the heart's area of dulness extends to the right side of the sternum. Very often, too, the heart's beat is visible in the epigastrium when the dilated right ventricle beats against the diaphragm, for then it is common to find the heart lying more transversely than it should do. The other signs of this condition have been alluded to under the head of Mitral Regurgitation, which ends in this, and which is described in a previous section.

MITRAL OBSTRUCTION, OR STENOSIS.

Contraction of the aortic orifice, especially with insufficiency, is, as we have pointed out, by no means rare, and in like fashion a certain degree of contraction of the mitral orifice associated with insufficiency of its valvular apparatus is not uncommon; but this is seldom to an amount to be indicated by any peculiar signs, save that the bruit begins rather before the ventricular systole, there is some passing tremor, and the signs of obstructed pulmonary circulation are exaggerated. For pure mitral stenosis we must refer to cases where the valves have become adherent to each other at either extremity, leaving only a slit-like orifice in the centre, or where the opening is narrowed congenitally or otherwise. Such cases are exceedingly well-marked, and these alone should be treated during life as true cases of mitral stenosis. The condition referred to is often found in weakly, badly-grown subjects, and is perhaps congenital, or at all events due to imperfect development, but may be due to early rheumatism.

The consequence of this mitral obstruction is, that the left ventricle is less easily filled than when the opening is free, as it generally is; but obstruction can always be overcome by employing greater force, and this is what under favourable conditions occurs. During the time that the ventricle is emptying itself, the blood accumulates in the auricle under pressure from behind, and as soon as the ventricle begins to expand, its pressure is great enough to open the valves, and to force some blood into the ventricle, which is finally fully distended, by the contraction of the auricle and the complete ejection of its

contents. The forces here concerned are the right ventricle, which drives the blood into the pulmonary vessels and into the left auricle, and the contractile power of the left auricle itself. In mitral stenosis, we should expect these forces to be increased, and accordingly we find hypertrophy of the right ventricle, and often also signs of hypertrophy of the left auricle.

Normally, immediately after the first sound, we have the second, due to closure of the semilunar valves, after which there comes a pause. During part of this pause nothing particular is going on, save noiseless filling of the ventricle under pressure from behind, but its latter part is occupied by what should be the noiseless contraction of the auricle. In pure mitral stenosis this rhythm is completely altered. Then we have a long rough sound, very much like an ordinary mitral regurgitant bruit, heard over a singularly limited area, usually just above and to the inside of the left apex, and this may be followed by a short, sharp, flapping sound, very like a normal second sound. But if we test these by the carotid pulse (the radial pulse is too late to afford a fair test) we shall find that the rough sound is finished before the pulse is felt, whilst the short, sharp sound corresponds exactly with the carotid pulse. In short, this bruit is pre-systolic, the short, sharp sound is the altered first sound, and often the second sound is not heard. One of the most characteristic features of mitral stenosis is the so-called "purring tremor," giving a sensation to the hand much like that of the back of a purring cat. This is synchronous with the bruit, *i.e.*, pre-systolic.

The explanation of these phenomena is easy. Owing to the mitral obstruction, the blood tends to accumulate in the pulmonary vessels, consequently each fresh injection by the hypertrophied right ventricle tends to keep up the increased pressure in these vessels, as is shown by the short, sharp second sound over the pulmonary orifice. This pressure forces the blood through the narrow mitral opening as soon as the ventricle begins to expand, which may be unattended by sound. But we also find the auricle beginning to contract earlier and more forcibly than usual. Its action may sometimes be distinctly seen in the form of an impulse against the chest, and it drives the blood through the narrow mitral orifice with force enough to give rise to the bruit and the tremor alluded to. But even in this way the ventricle is badly filled.

There is no obstruction at the aortic opening, and so a short, sharp ventricular contraction suffices to empty the ventricle and to modify the first sound. Undoubtedly many cases of mitral obstruction have been taken for cases of regurgitation, of which the purring tremor used to be considered a sign, mainly because men have not tested the rhythm by means of the pulse. In mitral obstruction the great difficulty is in allowing the blood a free escape from the lung; hence breathlessness is always a marked feature in such cases, and it is always greatly aggravated on exertion. Owing to the high tension within the pulmonary vessels also, hæmoptysis is not infrequent; it is the most frequent cause of pulmonary apoplexy, and gives rise to the condition known as brown induration of the lung. But with due care, the malady is not fraught with the danger one would suppose, as long as the hypertrophy of the right ventricle keeps pace with the mitral contraction.

PULMONARY OBSTRUCTION.

This condition is rare, save as a congenital affection and associated with open foramen ovale. It can hardly be diagnosed. A sound similar to that which should be produced by pulmonary obstruction is frequent in anæmia, and may be intensified in young people by pressing the stethoscope down over the third left costal cartilage, and making the patient expire as strongly as possible. This bruit is probably due to relaxation of the vessel's walls, so that the injected current impinges on comparatively still blood in the dilated vessel. With it are no signs of hypertrophy of the right ventricle, which we would expect in true stenosis. These, however, we may find in some cases of aneurism of the aorta pressing on the pulmonary artery and partly obstructing it.

TREATMENT OF VALVULAR DISEASE OF THE HEART.

Though no treatment of valvular disease can be considered curative, yet can we do very much to prolong life and give present comfort. To treat heart disease, as these valvular accidents are commonly called, aright, we must bear certain general principles in mind. We have seen that in almost every instance the conservative process set up naturally has been of the nature of hypertrophy; this therefore we are bound to foster, whereas the opposite and fatal tendency is to dilatation and weak-

ening, which we must strive to prevent. Now what makes the difference of tendency in many cases is undoubtedly imperfect nutrition and overwork, both generally and locally. Hypertrophy is much more likely to occur in early life than later on, and this we may take as our key to the position. Good nutrition and plenty of nourishment are not always the same thing, but at all events we can try the effects of good food. Again, as regards rest. We must get rest for the heart as well as for the body, and without doubt the heart has least to do when the patient is in the recumbent posture. Therefore let us put our patient to bed, and keep him there as far as possible. This is often not a very easy thing to do, but we must try. Even in the worst stages of the various forms of the malady rest does much good; but if the good is to be permanent, it should be tried as early as possible. As all muscles must have a period of rest, so has the heart, though only a short one: the ventricle rests during its diastole, and it is a curious circumstance that the circulation in the heart itself is diastolic. If therefore we can lengthen its diastole, we shall favour its nutrition. Again, anything like a waste of labour should be avoided, and surely it is a waste of labour, if the ventricle by contracting a hundred times per minute is doing very badly the work which might be done much better if the contractions were stronger and the evacuation more perfect, sixty times per minute. These indications are fairly fulfilled by the use of one particular drug—digitalis. This is not the place to inquire into its theoretical action, but clinically it is well known that digitalis does in many cases of heart disease slower, regulate, and strengthen the heart's beat; but, like all other drugs, its advantageous use requires experience. As a rule, digitalis, to be useful, requires to be given with no timid hand: half-ounce doses of the freshly prepared infusion given every four hours seems in most cases to do good. In some instances where digitalis did not suit, we have known belladonna give great relief and comfort. If the stomach is uneasy, belladonna may be given as atropine under the skin, in doses of from $\frac{1}{60}$ to $\frac{1}{30}$ of a grain. In almost every case iron is essential: it promotes nutrition, whatever else it does and however it does it, and this we greatly desire to see in most cases of heart disease. In many of the cases of heart disease in an advanced stage an extreme restlessness is one of the most distressing symptoms. In such there is no remedy like

morphia subcutaneously, in doses of a fifth of a grain. This will often procure a night's sleep, and consequently the rest so much wanted. Dyspnœa is always a troublesome concomitant of extensive valvular disease, but it is due to obstruction to the circulation in the lung, not to lung mischief; hence if we relieve the circulation, we relieve the breathing, and so we should look to the heart rather than to the lungs. However, the inhalation of ether often does good to both. In almost every form of heart disease exertion increases the dyspnœa. This is easily understood; if there be any regurgitation with each heart's beat, the faster the heart beats the greater will be the accumulation of blood on the wrong side, and the greater the obstruction to its onward flow. Hence the vital importance of avoiding all the exertion we possibly can, and if hæmoptysis do occur, we should not be too eager to arrest it. Sooner or later in almost every case we have to contend with dropsy, and the question arises—What is the best thing to be done? In many early cases a few days' rest and a few doses of digitalis and iron will suffice for its relief. Such a mixture as mistura ferri co. ℥ss and infusi digitalis ℥ss is theoretically incompatible, but it does good service. If considered too bulky, the tincture of digitalis (♏ x—xv) with vinum ferri or liquor ferri perchloridi may be substituted. Later, dropsy is not so manageable, and tries all the resources of the physician. Sometimes diuretics do good. One of the best is the old pill consisting of digitalis, squill, and blue pill; but perhaps even more efficacious is a saturated solution of acid tartrate of potass sweetened with sugar and flavoured with lemon, used as an habitual drink. The two may be combined: the pill given morning and evening, the drink throughout the day and night. Another diuretic we have seen do good service in heart cases consists of spirits of juniper, or Hollands gin, with acid tartrate of potash, in decoction of broom. As no one drug long retains its efficacy, it is important to have a series, so as to be able to ring the changes. In many cases diuretics do not suit; then we must try purgatives. That most frequently used is the compound jalap powder, but if given long it is apt to set up intestinal catarrh. Accordingly a solution of a neutral salt like the sulphate of soda or magnesia, especially if given effervescing, is often of more service; but in the use of purgatives we must beware of weakening the patient overmuch. Swelling of the legs and scrotum

often give rise to grave discomfort, and if so they should be punctured with a fine trocar or needle, such as is used for aspiration. Care should always be taken to puncture in the loosest parts. Either with or without puncture, sponging the limbs with tepid water, enveloping them in blankets, and surrounding them with hot bottles, so as to promote transudation from the skin, often gives great relief, but by the time we reach this stage permanent improvement is hopeless, and we must use our judgment how best to relieve the patient.

HYPERTROPHY—WITH AND WITHOUT DILATATION—OF THE HEART.

In the course of the foregoing description of the various diseases of the heart, almost every point relating to hypertrophy of that organ has been touched upon incidentally. Still it may be useful to bring all these together, and above all to bear in mind that there is a true hypertrophy, and a false hypertrophy. By true hypertrophy we mean increase in the quantity of muscular tissue constituting the walls of the heart. In false hypertrophy there is increased thickness of the walls, but it is sometimes due to increased growth of connective tissue. The former, if the tissues be not flabby, constitutes a powerful aid to the circulatory forces, the latter a great defect.

True muscular hypertrophy is generally spoken of as of two kinds, according as it is accompanied by dilatation or no. If there is no dilatation the hypertrophy is said to be *simple*; if there is, it is called *excentric*. Of the former we have an example in pure aortic obstruction; of the latter, in aortic regurgitation with obstruction. This last is by far the most common form and origin of the condition. Every cavity of the heart may have its walls hypertrophied, but the ventricles are so most frequently. The left ventricle is more frequently hypertrophied than the right, as the left side is the more subject to disease which demands compensatory hypertrophy, and disease of the left side though commonly ending in dilatation of the right side does not always or of necessity end in its hypertrophy. Yet on the right side are causes acting which do not prevail on the left. Thus all causes of pulmonary obstruction, including emphysema and contracted lung, affect the right side of the heart only. But, on the other hand, we not unfrequently find pure hyper-

trophy of the left side in the advanced stage of chronic Bright's disease, whatever be the explanation of its origin. Another condition affecting the systemic circulation and giving rise to hypertrophy of the left ventricle is extensive atheroma, causing roughness and rigidity of the main arterial tubes. To the same category belong occupations necessitating prolonged and powerful exertion, as those of rowing, hammering, &c. One of the most famous greyhounds on record had such a purely hypertrophied heart. Thus we may have some hypertrophy of the right heart alone from pulmonary obstruction, and hypertrophy of the left heart alone from systemic obstruction.

If both sides of the heart be hypertrophied and dilated, its shape tends to be more square than usual, and this is the more marked the more the right side is affected. When the left side alone is affected, the apex projects further outwards and downwards than usual, and as the septum is hypertrophied as well as other parts of its wall, the right ventricle may be so small comparatively as to come to look like a kind of appendage on its right side. With hypertrophy of the right side the heart extends over to the right side, and in such cases the heart lies lower and more transversely than usual.

Hypertrophy of the heart is in the main compensatory for some other lesion, and is intended to keep the condition of the circulation as nearly as possible normal. We might therefore expect few phenomena in the condition of the circulation to make us speak of them as signs of hypertrophy. In cases of chronic Bright's disease, however, there is undoubtedly some systemic obstruction in both the kidneys, and other parts of the body, most probably due to altered arterioles; but vascular resistance we do have as indicated by the hard pulse, and the sharp second aortic sound. In such a case, a hypertrophied heart may not be exactly a saving organ, for between the rigid arterioles and the powerful heart a vessel may give way. Such is apt to be the case in the brain, and such patients, who seem apparently quite well, will sometimes drop down in apoplexy, and when examined show the fatal triad of a big left ventricle, small, hard kidneys, and a blood-clot in the brain.

Among the local signs of hypertrophy with or without dilatation of the heart are alterations in the spot where the apex beats. If the left ventricle be affected it will beat outside the left nipple; if the right, there will be dulness too far to the right side, even

beyond the sternum, and very likely epigastric pulsation from the impulse of the right ventricle, direct or communicated. If both ventricles be affected, the apex beat will be too far to the left, and as low as the sixth or seventh rib. This is best ascertained by laying the hand perfectly flat on the chest, and then fixing on the exact spot of the apex beat by the finger. Sight in this case is not enough, as a large area of the chest may be moved by the impulse; and the exact site is best fixed by the hand. Besides the extent of the impulse there is another character of importance especially in pure hypertrophy—that is, its heaving power. This, however, is best appreciated by the stethoscope, though it is a sensation of **motion**, not of hearing. In lesser degrees of hypertrophy there is often a peculiar jarring sensation produced on auscultation, which the beginner is apt to mistake for sound. This, however, is of less value as a sign than the other. One thing is quite remarkable, in such cases we may see a chest violently beaten by every movement of the heart, and yet the patient complains of no palpitation. The signs derivable from percussion are mainly an increase in the area of dulness, and some degree of alteration in its shape. On listening over the apex it is usual to hear the cardiac sounds or bruits somewhat more clearly than usual, partly because the sounds produced are really louder, being produced with greater than usual force; partly because they are better conducted by the mass of muscular fibre, and the displacement of the lung.

Treatment.—Esteeming as we do hypertrophy to be almost invariably a conservative process, it is a thing to be encouraged, especially by rest, good food, iron, and digitalis, rather than opposed. In the kind of hypertrophy which results from over-feeding, we have really an atrophy to deal with. There is increased deposition of fat in and around the heart, but we have no real hypertrophy. Such cases are best treated by diet and regimen. When we have a hypertrophied left ventricle and small kidneys to deal with, we should be careful to warn our patient against anything, especially exertion or excitement, which would increase the intra-cranial blood-pressure, for, as we have seen, these patients are strongly predisposed to apoplexy by extravasation of blood from a ruptured vessel. A large and strong belladonna plaster over the region of the heart is the best remedy for troublesome palpitation should such arise in the course of the development of hypertrophy.

DILATATION OF THE HEART.

Dilatation may occur with or without thickening of the walls of the heart. The most frequent form is dilatation with some degree of hypertrophy. The main cause of dilatation is over-distension, and as habitual over-distension tends to become permanent, this may or may not be partially compensated by increased thickening of the chamber-walls. This over-distension may be brought about in various ways, chiefly by over-filling or imperfect emptying, which soon comes to the same thing. Moreover, if there be obstruction and the walls of the heart do not strengthen, then the increased pressure during contraction will also produce dilatation. Some degree of dilatation, no doubt, occurs whenever the heart is weakened, from whatever cause, but here recovery may readily take place. The same thing happens and becomes permanent when the tissues of the heart undergo degeneration.

The signs of dilatation are briefly these: an increased area of dulness, a diffused and weak, it may be undulating or tremulous apex beat, with a weak pulse and imperfect circulation. Hence there is dyspnœa on exertion, and a tendency to giddiness. Dilatation of the right heart leads to all the consequences described under mitral disease.

Treatment.—The treatment of simple dilatation such as results from weakening of the heart in acute disease is to give the patient good food, iron, and gentle exercise in the open air. All stress should be avoided, as tending to perpetuate the condition. In other forms of dilatation treatment is not promising, but we can palliate it by giving the heart as much rest as possible, by giving good food, iron, and digitalis, or, if these do not suit, belladonna. It is often a good plan to combine the two, applying belladonna externally, and giving digitalis and iron internally.

ABNORMALITIES OF THE HEART.

We do not here speak of all those curious abnormalities which are detected after death, or found in infants which have hardly lived, but of those which give rise to certain signs and with which life is still compatible. Most of them are due to imperfect development, or to the development of some part out of its turn. The most important of these are stenosis, or obliteration of the pulmonary artery with persistence of the foramen ovale; and stenosis, or obliteration of the aorta. Another condition less common is persistence of a communication between

the two ventricles, but except there be also some obstruction the existence of such communication may give rise to no important sign. In any case, a mixture of venous and arterial blood giving rise to *cyanosis* is the most characteristic feature of abnormal communications, where there is also obstruction. These patients have a slow circulation, cold hands and feet, are apathetic, and show a tendency to clubbing of the fingers, and thickening of the lips and nose. Such conditions give rise to all kinds of anomalous bruits; most frequently these patients are carried off by intercurrent diseases before they attain to any great age.

NEUROSES OF THE HEART.

PALPITATION.

Foremost among the functional derangements of the heart is palpitation, which may be produced in various reflex ways. Palpitation consists essentially in alteration of the heart's beat, so that it becomes painfully perceptible to the individual. Most frequently the alteration is due to quickening, and irregularity of beat as to rhythm and force, and may be brought about in a variety of ways. Thus it is frequently due to anæmia; or associated with indigestion, the irritation in the latter case being conveyed from the stomach to the medulla oblongata. Thence the influence may be propagated to the heart in two fashions, either as an inhibitory force, by the vagus; or again, as a stimulant force, by the spinal cord and ganglion stellatum. Most probably palpitation is due to irregular explosions of inhibitory power through the vagus. Palpitation, as we have seen, is one of the most troublesome symptoms of some forms of heart disease. Then it is often due to irregular and over-frequent action of the heart, striving to get rid of its overloading; or it may be due to one side acting before the other, as sometimes happens when there is special obstruction to the outflow of blood on either side.

Treatment.—The treatment is mainly causal. If due to indigestion, remedy this as far as possible. In any case, effervescent draughts and diffusible stimuli are of especial value, none are better than the aromatic spirit of ammonia, ether, and spirit of chloroform. In most cases iron is indicated. If it arises from any special conditions of the heart, remedy these as far as possible. For this no remedies are so good as digitalis and belladonna, given as already directed.

ANGINA PECTORIS, OR BREAST PANG.

The exact nature of this terrible malady is hardly understood, but it is generally assumed to be neurotic, even though associated with certain cardiac lesions, especially calcification of the coronaries, and aneurism of the aorta. Hence it is commonly called cardiac neuralgia. The attack is almost invariably sudden and without warning. Pain and terror are its chief attributes. The pain is indescribable, the feeling one of inevitable suffocation. The special seat of the pain is low down over the sternum, but other painful dartings in various directions are commonly perceived, especially in the course of the aorta and great vessels on the left side, even down the left arm or left leg. The only escape during the period of pain seems death, but after the seizure has gone by the patient may enjoy a fair amount of health till the next attack. During the attack the pulse is, as a rule, small; but it may be quite regular—perhaps a little quickened. The face is pale and covered with a cold sweat, and expressive of the utmost anxiety in the true neurotic malady. If blue and congested, we may be sure we have something more than a neurosis to deal with. The fit does not last very long—sometimes only a few seconds, lasting longer perhaps at each subsequent attack; but at all events tending to recur more and more frequently. It leaves the patient somewhat suddenly, often with belching, sometimes with profuse flow of urine. Yet, if we examine the heart, beyond weakening of its beat, we may find little amiss in its action; there is apparently nothing to account for the seizure. These seizures are most readily induced by mental excitement; but physical exertion—as walking up a steep hill—or indigestion, may bring them on. Whenever they do occur, they tend to recur, and what at first would have no influence in producing them, may after a time readily bring them on, but with care an attack may be long avoided in a good many cases. Some, however, seem to die in the first paroxysm, if we are to judge from the absence of any definite lesion found after death in certain cases. Sometimes the death is sudden, at others it seems to come on by gradually exhausting the patient. One attack of angina so predisposes to another, or at all events another is so likely to follow it, that we can hardly hope for a favourable ending; nevertheless, much may be done to prolong life by care and attention.

Treatment.—During a fit we have a remedy which promises well, but which has not yet been fairly tested. Nitrite of amyl has certainly in some instances given astonishing relief. A whiff or two from the bottle is all that is required. Ether and chloroform have hardly been sufficiently tried. Morphia subcutaneously should promptly be given, and if the patient has any forewarning, it should be given at once on its occurrence and repeated if necessary. During the intervals everything should be done to prevent a recurrence of the attacks—serenity of mind, a quiet life, and good digestion being the most important prophylactics.

DISEASES OF THE AORTA.

INFLAMMATION OF THE AORTA—ATHEROMA.

Inflammation of the outer and middle coats of the aorta hardly concerns us in such a work as this, but the chronic inflammation of the intima or inner coat, and the subsequent changes which the inflammatory products undergo constitute one of the most important of vascular diseases. They constitute the condition we call *atheroma.*

This malady is most common in those exposed to violent strain of the aorta, or those in whom some special irritant has been at work. Hence again it is most common in the arch of the aorta near the giving off of the great vessels, and in the subjects of gout, syphilis, and intemperance. It is not infrequent in advanced life, and seems to have a special predilection for such portions of the great vessels as have been in any way weakened by previous stress or disease. The first change seen in the interior of the vessel is a slight elevation of its inner surface at certain points, or in patches. The endothelium is entire, but the substance of the intima is infiltrated with cells more or less rounded, and fibres of young connective tissue. According to the quantity of young cells the patch is soft, or hard and semi-cartilaginous. The latter kind, which is most commonly seen, is in the earliest stage of a bluish-white colour, but soon undergoes alteration. Fatty degeneration sets in, fat granules form in the new tissue at the expense of the newly-formed cells, which break down into a pasty substance

consisting of fatty granules, cholesterine, and degenerated connective tissue. Still a thin covering separates this mass from the blood-current, but that too may give way, exposing the pasty material, which is soon washed away, leaving an irregular ragged cavity which might be called an ulcer. In other cases, instead of proceeding to a break-up of the atheromatous spot, we find that calcification replaces the fatty change. Salts of lime are deposited in and around the connective tissue corpuscles; in some cases, so as to give rise to a true bony formation. In the aorta these calcified deposits are usually in the form of plates or scales; in the smaller vessels they may form complete tubes. In either case, though at first separated from the blood by a thin layer of the intima, this may also give way, and the rough, bony plates project, offering notable resistance to the blood current. The other coats of the vessel, though at first unaffected, finally share in this process to the extent of becoming fatty or thickened and indurated. This is the most common termination of endo-arteritis.

The signs of early atheroma are very badly defined, but in the later stages, when the smaller arteries are affected, we may judge of its existence in the aorta, when together with rigidity of the distal vessels, we have hypertrophy of the left ventricle without any valvular mischief to account for it. At the same time the pulse seems full, hard, and unyielding, whilst the second aortic sound—slower and longer than usual—shows signs of imperfect arterial recoil.

As for *treatment*, that is, as far as we know, fairly beyond our reach. If we know of the existence of atheroma, our efforts ought to be directed to withstanding its two most important consequences—aneurism and rupture.

ANEURISM OF THE AORTA.

By aneurism of the aorta we understand a partial and irregular dilatation of the vessel, with or without giving way of its walls. Uniform dilatation of its walls is not included by such a definition. Aneurismal dilatation is commonly due to changes in the inner and middle coats of the vessel, following atheromatous or fatty degeneration. Owing to such changes, the walls of the vessels become less elastic and gradually yield from the pressure of the blood; or under some sudden strain, rupture of one or more of the

vascular coats takes place. Then follow dilatation and formation of an aneurismal sac at the expense of the other coats. Such causes operate more especially on men; women are more rarely the subjects of aneurism, except their vessels are highly diseased and they receive a sudden injury as from a fall or a blow. Moreover as diseased vessels in the young are rare, aneurism in either sex is a disease of middle or advanced life rather than of youth.

The most frequent variety of aneurism is that where a sacculated tumour projects from one side of the vessel. For the most part, the neck of this aneurism where it joins the vessel is of smaller diameter than the fundus of the sac. Such aneurisms vary exceedingly in size, and usually contain some amount of coagula. Other forms of aneurism are globular or fusiform, but these are less frequently met with than the sacculated variety. Often we find that the vessels which proceed from the aneurism are altered in shape, or blocked in whole or part by coagula. Sometimes the aneurism presses on the aorta above or below the point of its origin. But the effects of an aneurism of the aorta are not confined to the vessel alone; the parts in the neighbourhood, which are many and important, suffer from *pressure*. Very often the trachea or bronchi are so pressed upon; more rarely the œsophagus suffers. Again the heart may be pushed downwards, the recurrent laryngeals interfered with, and the bones, when the aneurism reaches them, gradually absorbed, giving rise to very severe pain, or it may be that they are dislocated. This last accident is especially prone to happen to the clavicle where it joins the sternum. Pressure gives rise to severe and characteristic symptoms, and not unfrequently kills the patient. If it does not kill sooner or later the wall of the aneurism bursts and its contents escape, either at once or by degrees, for it is a mistake to suppose that such ruptures may not heal for a time. The points of rupture most commonly seen are into the pericardium, the trachea or bronchi, the pleura, the œsophagus, the substance of the lung itself, or some neighbouring vessel, especially the pulmonary artery. Sometimes we have known aneurism of the aorta kill in the same way as mitral disease, by pressure on and consequent obstruction of the pulmonary artery, giving rise to dilatation of the right heart and general dropsy. It is important to understand that the pressure and other symptoms may vary from time to time, according as the aneurism tends to grow in one direction or another. Thus an aneurism of the ascending aorta involving the

innominate—perhaps the most frequent variety—tends as a rule to grow upwards and outwards towards the right side, so as to press against the right margin of the sternum, the two upper ribs, and the clavicle where it joins the sternum, and to present a pulsating tumour there. Nearly all the signs of such a tumour may, however, for a time be absent, and only signs of pressure on the right recurrent laryngeal, or on the air-passages be detected. So too of an aneurism originating more in the concavity of the arch of the aorta, and pressing on the left recurrent and left bronchus; signs of such pressure may for a time nearly or altogether disappear, and only signs of pressure on the œsophagus remain. Aneurisms on the left side of the ascending aorta may press on the pulmonary artery or right auricle, as already pointed out, and may open into them. In the descending thoracic aorta they tend to grow towards the left back, and generally open if at all into the pleura or externally. The aneurisms of the abdominal aorta sometimes attain to very great size, and burst either into the peritoneum or into the connective tissue lying behind it. There is one variety of aneurism sometimes seen, which, opening into the wall of the vessel at one point, again makes its way into its channel at a spot more remote from the heart, separating the coats of the vessel, and hence called a *dissecting aneurism.*

In most cases of aneurism pain is a prominent symptom, though some patients may perish by its bursting before the tumour has had time to become sufficiently large to be a cause of distress, for the size of an aneurism is one of the most important elements we have to consider. To this element, *i.e.*, pain, is in a great measure due the emaciation present, though in a few cases emaciation may result from pressure on the thoracic duct. The pain experienced is partly local, due to the direct influence of pressure, as when the aneurism throbs against the vertebræ or sternum, or against the intercostal nerves. Another form of pain is due to pressure on other nerve-trunks, especially those belonging to the brachial or cervical plexus, which being referred to the periphery of the nerves, gives the impression of pain extending from the right or left arm, according to the site of the aneurism, or located specially in the armpit. This pain is usually paroxysmal. The spot where the aneurism points is very often tender in the extreme, so that the slightest pressure, even of clothes, is hardly bearable. Other signs are due to pressure on

the respiratory organs or their accessories. Chief among these is the effect of pressure on the vagus or its branches, especially the recurrent laryngeals. The consequence of this irritation is closure more or less permanently of one vocal cord, so that there is stridulous breathing as in croup, the attack coming on paroxysmally, with occasional loss of voice; but pressure on the trachea or bronchi will give rise to more or less dyspnœa and cough, always troublesome symptoms. This cough is usually dry and hoarse; but the pressure may give rise to bronchitis, and so there may be expectoration of mucus, and if the aneurism opens into the bronchi this will be from time to time mixed with blood, for the opening in such a case is small and easily closed, not the great rent we see in a serous membrane like the pleura. The breathing may be quite calm if there be no pressure; if the pressure be only slight, fits of dyspnœa may come and go from time to time, or it may prove continuous with periods of aggravation. When this last is the case, the breathing is usually whistling in character, and the patients refer to the trachea as the site of the difficult respiration. To relieve this pressure, and to facilitate respiration, the patient assumes all kinds of postures—some which in health would be unbearable for any length of time. Very frequently the posture is the same as in asthma, sitting with the head resting on the hands, and the elbows on the knees or on a table. In this attitude the patient will have fitful slumbers, but seldom for long, waking up with a start, and, even while they last, distracted by horrid dreams, due to another factor of the case, interference with circulation. The same condition gives rise in many patients to an habitual expression of distress, but the facial aspect varies with almost every case. Another of the pressure symptoms is dilatation of one pupil, and, it may be, unusual redness and heat of one side of the face, from pressure on the sympathetic on that side.

There is almost always some interference with the circulation, varying, however, in character and amount. In the first place the interference is *direct:* the existence of an aneurism containing a quantity of comparatively still blood offers a marked opposition to the pulse-wave, so that an interval longer than usual intervenes between the heart's beat and the pulse felt beyond the aneurism. This is especially notable if the aneurism affects the vessel beyond the innominate, and involves the left subclavian; then the left pulse is distinctly later than that

on the right side. This opposition to the blood-flow may in some cases be for a time neutralized by hypertrophy of the heart; but this hypertrophy, with the increased pressure on the aorta, tends of course to favour the extension of the aneurism, and to render its own influence futile. As a consequence of this overstrain on the heart, we find palpitation developed, together with dyspnœa, badly-filled arteries, and over-filled veins. But, if possible, a more serious interference with the circulation arises *indirectly* from pressure. Thus the right auricle, or more likely the superior cava, may be pressed upon; hence follows engorgement of the veins in the upper part of the body, whilst the lower limbs are almost invariably quite free from œdema. If one side be affected more than the other, there will be more venous turgescence on that side, with, in some cases, bulbousness of the fingers, œdema of the face and upper extremity, and a fleshy turgescence of the neck, sometimes spoken of as a fleshy collar. From the same cause there is headache, dizziness, and congestion of the conjunctivæ; and blueness of the lips and face is common. The bleeding from a ruptured aneurism, we must again repeat, is not necessarily of the nature of a gush, especially when it opens into the trachea, bronchi, or œsophagus. When, however, it bursts into the pericardium or pleura, a single gush usually proves fatal.

Aneurism of the descending aorta is commonly more difficult of diagnosis than that of the arch of the aorta. All kinds of anomalous pressure symptoms may arise therefrom, whilst, on the other hand, its existence may be unknown to the patient. There is an anomalous condition of this vessel not infrequent among nervous females, where the vessel seems to be dilated and free pulsation is seen in the epigastrium. Such cases, especially if any semi-solid object be interposed between the vessel and the anterior wall of the abdomen, may be taken for aneurismal and treated accordingly, to the aggravation of the patient's condition and even risk of life. As the pressure symptoms may be produced by any form of swelling, it is important in such situations to seek out carefully the physical signs of aneurism and to rely only on these.

In the thoracic aorta inspection may be enough to show the existence of a pulsating tumour, if it has already reached the surface. The bulging is conical in shape, not confined to the soft parts, and very tender as well as painful. By placing the hand over the tumour the impulse is more distinctly felt than seen, and may even

amount to a kind of thrill. Pulsation alone is by no means sufficient to establish the existence of aneurism, especially in the neck, but a pulsating tumour in the second right intercostal space is always suspicious, though not a certain sign of aneurism. Such a sign is of less value just above the manubrium, though this is the common site where aneurisms of the middle of the arch tend to point. Aneurisms of the descending aorta, as a rule, grow backwards, pressing on the œsophagus and eroding the vertebræ. In the abdominal aorta we can hardly ever be sure of our diagnosis, save we succeed in finding the extensile impulse or vibratile thrill as well as the mere forward heave; but even this may be simulated. Bruits are frequently present and frequently absent, sometimes as a simple tone or murmur, sometimes as a double one, sometimes even diastolic in point of time, but most frequently blowing or grating in character. Their absence is of little clinical importance. Wherever the aneurism reaches the walls of the chest we have dulness on percussion; but to depend on that alone is insufficient, for we may have it without aneurism, or it may be absent with a very large one. Sometimes we have dulness both in front and behind, on the right side and on the left side; and this dulness may be due to aneurism, new growth, or consolidation of lung, all more or less mixed; but percussion is risky as well as painful when the swelling points, and should not be too much employed, as it distresses the patient. Sooner or later, aneurism of the aorta leads to death—except the patient be carried off by intercurrent disease, by exhaustion, by the effects of pressure, or by rupture; the latter being less frequent than is generally supposed.

Treatment.—Nevertheless, very much may be done to ward off a fatal termination, and with care the subject of an aortic aneurism may live for years. Of course the prognosis is bad when the sac is very large, and the patient debilitated, as is usually the case in old age and with habitual drunkards. But with a healthy individual in whom the aneurism has been induced by exertion, and who can afford to lay aside work, we may even predict the chance of a cure. The first and last condition of procuring the cure of an aortic aneurism is *rest*. True, there have been some wonderful successes with surgical measures—such as tying the carotid and subclavian, or one of these vessels—but such results are not easily explicable, as far

as we know: whereas the effects of rest are readily understood. Nevertheless, such successes should not be lost sight of. Now in keeping a patient quiet there is no doubt whatever of the efficacy of morphia subcutaneously, and this should be assiduously given even to large doses. In the olden time there was an idea that low feeding and bleeding were good things for the cure of aneurism; such ideas very few now entertain. Still, upon the whole, stimulants are to be avoided, save for occasional paroxysms of dyspnœa and pain, when they are of the utmost service, whilst the diet should be limited in point of bulk. As regards internal remedies, many have been highly vaunted—digitalis, acetate of lead, opium, belladonna, iodide of potassium; but all have been found wanting when fairly tried. In point of fact, the effects of absolute rest in bed have been confounded with the effects of these remedies, and we have seldom seen a case of aneurism treated by absolute rest alone which did not improve for a time; but equally certainly in most cases came only temporary improvement, and that only to a certain extent. It is seldom we can induce a patient who feels nothing the matter with him to keep on his back for weeks and months, and such is often the history of a case of aneurism. Electro-puncture is still on its trial; but pressure has fairly succeeded in a certain number of cases of abdominal aneurism.

When the aneurism begins to point externally we can often do much to save pain and prevent progress. Here again subcutaneous injections of morphia are the great thing, with, if the patients will stand it, ice externally; if they cannot, we must try something else. The next best thing is belladonna, in the form of extract, reduced to a thin paste with glycerine and smeared over the part. Some, however, cannot bear this—it irritates the skin; and in them a covering of cotton wool may give comfort when everything else has failed. Even a covering of tin or leather has been recommended as a protective. If an aneurism bursts in certain situations, it too often kills; but in others coagulation is apt to take place, and for the time recovery. This is promoted, as in other cases, by rest and quiet, by the application of cold over the spot externally, and especially by the use of ice for sucking. Still, unfortunately, in most instances we have to fall back on the original prognosis—from treatment comes temporary cure; *Sed hæret lethalis arundo.*

DISEASES OF THE LUNGS AND AIR-PASSAGES.

DISEASES OF THE LARYNX.

Affections of the larynx might be classed in two groups. In the one the malady is strictly laryngeal; in the other the laryngeal affection is only part of a more general condition which has involved disease of the larynx. But though such a grouping might be easily adhered to, one rougher but more useful seems advisable.

LARYNGITIS.

Inflammation of the larynx, formerly termed *cynanche laryngea*, may either involve the mucous membrane only, or the tissues below that membrane. The former—catarrhal inflammation or laryngeal catarrh—constitutes the common variety of the malady, the latter that which is called œdematous. Laryngitis most frequently occurs among flabby people, ordinarily but little exposed, who for some reason have been subjected to cold and wet, especially cold winds and wet feet. Any previous attack strongly predisposes to another, and it is particularly fatal to young people. People who spend much of their time out of doors, even when constantly shouting, as hawkers do, suffer much less frequently than those only occasionally exposed to such influences. Often it spreads downwards from the nares, less frequently upwards from the bronchi. It begins with a feeling of roughness, dryness, or tickling, and a slight tendency to cough, with pain in swallowing, but in some cases these are speedily aggravated. The voice is altered and generally lost, the cough is hard and croupy, and very painful. The respiration is prolonged, wheezing, and then stridulous; later in the disease it may be extremely difficult or impossible. The pulse is hard and quick, the skin hot; in the advanced stage of the disease there may be much perspiration. In fatal cases all the signs of imperfectly aërated blood manifest themselves. It is not always easy to tell this malady from croup in the early stage, but later on in the latter the exudation makes that plain. The

great risk lies in the submucous swelling (œdema), especially in the small larynx of childhood. This affects the parts where the connective tissues are laxest, especially in the epiglottidean folds. Œdema is often especially well marked in that form of the malady seen in children who have drunk boiling fluids, where scarification, however, promptly gives relief.

Laryngitis may be acute or chronic: the former we have just described; the latter, though a much less formidable, is a much more troublesome and intractable malady, for whereas the acute form ordinarily subsides in a few days, the chronic variety tends to last almost an indefinite period. The patient complains of a sense of tickling in the part, and hoarseness to a varying extent, and this is often most marked after resting the organ, when it starts off badly as if it wanted oiling. The respiration is not affected and the constitution does not suffer; but examination with the laryngoscope shows reddening of the vocal cords or epiglottis. Most frequently only a small patch is so injected, the congestion being very partial; and little pellets of mucus may he seen here and there adhering to the wall of the larynx. In old people especially it is often complicated with bronchitis. In certain forms of chronic laryngitis the minute glands of the part seem mainly implicated. In others still the congestion is mainly venous and the veins are varicose. In the last form there is often pigmentation of the mucous membrane from previous hæmorrhages.

Our knowledge of all forms of laryngeal disease has been very greatly advanced by the use of the laryngoscope, and it may now be said that its scientific use is incumbent on all practitioners in throat cases. A little practice and moderate patience will soon render any one sufficiently expert, and the knowledge thus gained is absolutely invaluable. A knowledge of how to use it is here taken for granted in all.

Treatment.—Laryngitis, as already pointed out, tends to recur, and it thus becomes of importance to avoid any risk of recurrence, but that is best done by habituating the throat to exposure, to cold water, and the like. Often the tendency begotten of smothering wraps round the neck is entirely got rid of by abandoning these and well washing the neck and chest in cold water every morning, following up this application with the thorough use of a rough towel. Nevertheless, damp clothes are to be avoided,

and any attack should be promptly dealt with, for chronic laryngeal catarrh is a most troublesome complaint. Supposing then a patient who is known to be subject to laryngitis falls ill, say after exposure, with hoarseness and the other symptoms already mentioned, it is best to put him in a warm bath, or his feet in warm water. Give him a good dose of Dover's powder if over the age of two years; if under, a little ipecacuanha wine only, and apply either a cold compress to remain all night, or a hot sponge to remain a few minutes to the throat. The temperature of the room should be kept tolerably high and perspiration favoured. But next morning, when probably the local symptoms have gone, the patient should have a good cold sponge or dip before exposure to the weather. Sometimes a sharp application of nitrate of silver followed by hot-water gargles and steam may cut the malady short, but everybody does not care to have recourse to such means.

Two modes of treating laryngitis have recently come into vogue; these are by inhalations and spray. Inhalations can be given either by apparatus of special kinds, or by the simple procedure of taking a basin of hot water, placing in it a breakfast-cup or other similar utensil, turned upside down; on the bottom pour the material to be inhaled, and cover head and all with a towel. Benzoin and conium are recommended in this way. Spray apparatus are now common enough, and are a valuable means of treating laryngeal affections. In some steam is used instead of air as the atomizing agent, and so the value of the two modes is combined. It is, however, in chronic catarrh that the use of the spray apparatus seems most valuable. Nitrate of silver is best applied in strong solution (sixty grains to the ounce) by tying a morsel of lint or cotton wool to the end of a penholder. Where œdema threatens, scarification is the proper remedy, if it can be made use of; if not, tracheotomy may be the only resource.

In more chronic cases spray may be made by the ordinary handball atomizer, containing perchloride of iron, corrosive sublimate, sulphate of copper, alum, or chloride of zinc. All of these may be used in turn if the disease do not yield, for it often happens that after a time a milder astringent will do more good than one more severe, if its use has been too prolonged. Sometimes the use of the brush or morsel of lint is better than spray, especially for applying solutions of drugs in glycerine, as alum, tannin, &c. Inhalations are good in many cases—creosote,

oil of turpentine, pine oil, oil of juniper, and the like being so employed with great advantage.

Sometimes change of climate seems to be essential, and the use of certain mineral waters commonly conduces greatly to improvement of chronic laryngeal catarrh. As a rule, dry, bracing climates suit best, but east winds and moist south-west winds prove, as a rule, injurious. The waters which are most useful are of the saline variety. Ems is highly spoken of; but sulphur springs, whether at home or abroad, are frequently also of inestimable service, though we can give no very good reason for their being so.

ULCERATION OF THE LARYNX.

Ulcers of the larynx may be simple—that is, due to excessive catarrhal inflammation, occasioning a breach of surface—or to excessive cell-formation in and around the acinous glands of the parts. This may be due to tubercular deposits, to syphilis, or to the typhoid or variolous poisons. The simple form of ulcer can only be considered as a special form of the laryngitis already discussed, and the same rules of treatment may be said to prevail, except that it is advisable to try to apply astringents, directly to the sores, and not by way of spray or inhalation.

Laryngeal phthisis is a very serious complication of the lung mischief. In it we usually find that the posterior wall of the pharynx, which is rich in lymphoid elements, is the part first attacked, and that thence the ulceration spreads both upwards and downwards. The tubercle takes on the infiltrated character, but the adenoid tissues round the acinous glands are especially prone to its attacks, and so we generally find the orifices of these red, prominent, and ulcerated. At the same time it may be impossible to make out the actual existence of tubercular deposit in the lung when the ulceration is already far advanced in the throat, for the laryngeal affection may be the earliest sign of constitutional taint, though it most frequently appears only after the lung disease is considerably advanced.

The first signs of this malady are usually hoarseness, with some difficulty in swallowing; and when at the same time with these there is known to be disease of the lungs, we may look out for tuberculous disease of the larynx. The hoarseness does not depend on disease of the vocal cords themselves, but on their relaxation and

thickening, or on the tenacious secretion adhering to them. Later the voice entirely disappears. This is when the ulceration has extended to and attacked the cords. Cough is as a rule a most troublesome symptom, brought on by the slightest causes, and often most violent. Swallowing is very painful, especially when the parts about the epiglottis are affected. This may be due to imperfect closure of the glottis, but is also in part dependent on the raw condition of the throat. Examined by the laryngoscope, if very early, we may only observe pallor, or it may be the opposite condition of redness. The ary-epiglottic folds are swollen and infiltrated, looking like two pyriform tumours. The epiglottis is also often infiltrated about the base, and its shape and position altered. The false vocal cords are sometimes implicated, as in the later stages are the true vocal cords. There is, as a rule, but one end to this painful malady—death, sooner or later; more likely, however, from the lung disease than from the local affection, but that adds most materially to the patient's sufferings.

All *treatment* under such circumstances is vain, but much may be done to alleviate pain and discomfort. Death may, though very rarely, arise from arrest of respiration from closure of the glottis by spasm, acute œdema, &c. This may be obviated by tracheotomy. The ulcers of the pharynx and larynx may be greatly improved, and swallowing facilitated by nitrate of silver in strong solution. Frequently nothing does so well as atomized warm water with a little tannin or alum, though some prefer liquid extract of opium used in the same way. Morphia lozenges gradually sucked are very excellent palliatives. Other astringents may be used in the like fashion. Some speak highly of the administration of food by the stomach-pump, when swallowing is difficult. When this is so, the difficulty in swallowing often arises from passage of the food into the glottis; any means of carrying it past this point must therefore be of service. Thick food is more easily swallowed than thin, and gulping is easier than sipping. Rest for the vocal cords too is important: hence speaking should be restricted and silence enforced.

Syphilitic disease of the larynx may be either seen in the early or late period of the constitutional symptoms. In early syphilis, condylomata may form on, or near the vocal cords at their posterior parts, and on the walls of the larynx adjoining. They are flat, whitish-looking prominences of

various sizes. These give rise to hoarseness and cough, though not situated on the cords, but only in their vicinity. When the history leads us to suspect such growths the laryngoscope makes the diagnosis clear. But, besides the condylomata, there may be superficial reddening or even ulceration, apparently dependent on syphilis. All these are readily got rid of by stimulant applications, particularly of corrosive sublimate, and by a mercurial course. In advanced constitutional syphilis a new set of growths are encountered—the so-called gummata. In this stage gummy tumours are developed in many parts of the body: their tendency is to soften and break down, leaving a deep ulcerated cavity with a dirty-yellow base and discoloured and jagged edges. The epiglottis is most prone to this form of disease. With this there is great difficulty in swallowing. These ulcers, however, tend to heal under appropriate treatment, but there is a great risk of adhesion to adjoining parts, and consequently retrenchment of the pharynx. Œdema is a frequent accident in gummy tumours of the larynx, and may require tracheotomy.

The *treatment* of this last form of syphilitic disease is sufficiently simple. It consists in iodide of potassium in ten to thirty grain doses three times a day in bark and ammonia, and the free application of nitrate of silver to the ulcers. With such treatment they soon heal. Mercury, as a rule, should not be used in this stage, but almost always in the earlier one.

In *small-pox* we may find that the eruption extends by the fauces as far as the larynx. The laryngeal affection may be slight, or it may be severe enough, in the form of a violent inflammation and formation of false membrane, to cause death. Usually it is only pustular or papular, and gives little trouble. The symptoms are those of ordinary catarrh, but the accompanying eruption on the skin gives the clue to their nature. In some epidemics of small-pox the croupous form of laryngitis is a very serious complication.

Measles and scarlet fever give rise to laryngeal complications of varying severity, usually either catarrhal or croupous. They are not so serious as those sometimes seen in typhus and typhoid. In these diseases the most dependent part of the larynx becomes infiltrated, and ulceration may follow. In typhoid this infiltration is probably of the same kind as takes place in Peyer's glands; in typhus

hypostatic congestion and a weakened circulation have more to do with the ulceration or sloughing. These conditions may not be diagnosed during life, but as they may give rise to œdema or destruction of the cartilages, they must be borne in mind as possible—nay, in typhus, probable complications.

ŒDEMA OF THE GLOTTIS.

Œdema glottidis, though rather a symptom than a disease, is nevertheless too important to pass by, as it may occasion death in a few minutes. Like other forms of acute œdema, it depends partly on anatomical peculiarity, partly on the existence of some exciting cause to induce change in the condition of the structures implicated. Œdema of the glottis, then, depends on these factors. The mucous membrane of the larynx is at almost all points closely attached to the cartilage beneath, and to the subcutaneous connective tissue; hence there is no room for transudation; but in the base of the epiglottis and in the folds stretching thence to the arytenoid cartilages there is plenty of loose submucous connective tissue. Given this anatomical condition, with any local inflammation or acute morbid process, ulcerative or otherwise, in the neighbourhood of the epiglottis, and the effusion may soon be effected, and the swollen epiglottis and ary-epiglottic folds completely obstruct respiration. At first there may be only the signs of the local malady somewhat intensified, but soon to these are added those of impending suffocation. Each inspiratory act draws down the swollen epiglottis over the vocal cords, and covers the opening as with a valve. These prolonged and laborious inspirations are only able to draw in a little air by the side of the swelling at an enormous expense of labour and with a sound altogether disproportioned to the quantity of air inhaled. On the other hand, expiration is comparatively easy, though it may be noisy; and this is a great diagnostic between it and croup, where there is no such disproportion between the two acts. The fact that œdema of the glottis is almost always an affection of adults, and croup of children, will also supply a means of identification. The malady once seen, however, is not likely to be forgotten; it is horrible to the patient and bystander alike. Impending suffocation frightens the one, these sufferings and a feeling of helplessness the other. But in a short time coma from

imperfectly aërated blood supervenes, and if relief be not afforded, death speedily follows. This, however, should not be the case. Treatment, if prompt, is almost invariably successful. If medical relief be not at hand, the patient should be placed in a warm bath, and given ice to suck. This will often suffice. On the other hand, heat to the throat in the form of a hot sponge, and steam to be inhaled will often speedily remove the swelling. But the practitioner should be above such remedies. Take a common curved bistoury, wrap it round with plaster or lint till only the sharp hook-like extremity and a quarter or an eighth of an inch of blade is to be seen; put the forefinger of the left hand to the back of the patient's mouth, when the swollen epiglottis will easily be felt. With this as a guide, one or two cuts or scarifications in the swollen mass are easily made. Hot water gargles will promote bleeding, and the patient recovers almost as miraculously as the attack came on. No time should be lost; the thing is as easy as opening a tonsil. Should, however, the practitioner arrive too late to be enabled to wait for this—*i.e.*, if the patient is getting blue in the face—tracheotomy should be instantly performed. Thus the patient's life may be saved till other measures can be taken. In any case, prompt and decided action is of the utmost value—indeed, it may be said that to do something at once is better than to wait till what is best can be done.

LARYNGEAL NEW GROWTHS.

As elsewhere, we may have in the larynx new growths, of a benign and of a malignant character. The former might be described as polypi and warts, the latter as cancerous. Warts, or papillomata, are there the most frequent variety of new growth. They are hypertrophies of the papillæ, especially of their epithelial portion, and are of various sizes, sometimes as large as a cherry. When removed they tend to recur. Polypi are also not unfrequent, and are either true hypertrophies of the mucous membrane or true fibrous growths, but they often contain some cystic matter. The malignant growths are, as a rule, either epithelomatous or very rarely medullary. Epithelioma may begin in the larynx, and after destroying the cartilages thence extend to other parts, as the œsophagus, forming a ragged and discoloured ulcer; but probably it more frequently extends from other parts to the larynx

than vice versâ. The same is true of medullary growths.

The earlier signs of laryngeal growths are referable rather to chronic laryngitis than to the growth itself; but the voice is commonly altered, hoarse or whispering, and the breathing impeded, especially as regards inspiration, which is often crowing. The cough when present is often croupy. Such signs admit of no diagnosis of new growth —that must rest with the laryngoscope. By it the papillomata are seen to be warty, cauliflower-looking excrescences, light in colour, and growing from the vocal cords or their neighbourhood; their size is commonly about that of a split pea; they are generally sessile, and often multiple. Fibrous and fibro-cellular tumours are larger, smoother, and pedunculated. They are usually single, and are attached most frequently to the vocal cords. The cancerous growths tend either to tumour or ulceration, or both; but epithelioma tends rather to ulceration, medullary growths to tumour. Often it is difficult to see these from displacement caused by the new growth. In epithelioma swallowing is often difficult and painful, sometimes impossible; so that the patient may die of starvation. These growths may also cause dangerous spasm of the vocal cords, endangering life from suffocation.

Treatment.—The proper remedy for most of these growths is removal by the aid of the laryngoscope. Various instruments have been used, but the best seems the snare. This should only be tried, however, after the throat has been well accustomed to manipulation, or disappointment will follow. Some operators prefer forceps, and no doubt the application of these is more easy, and where these growths cannot be removed, they may by their means be crushed—a process often insuring their rapid atrophy. The application of lotions is seldom advisable, except the growths be so lowly organized as to be easily destroyed. If suffocation threatens, from any cause, tracheotomy should be promptly performed, and the patient allowed to rest till the operation is perfectly recovered from. Opening the larynx in the median line has been successfully performed when removal of a growth in the ordinary way seemed impossible. Often, however, this is followed by unsatisfactory results, especially as concerns the voice.

NERVOUS AFFECTIONS OF THE LARYNX.

By nervous affections of the larynx we desire to imply laryngeal symptoms having a nervous origin; we may also attempt to deal with the causes of the neuroses. As elsewhere, these nervous affections may interfere with motion or sensation. And as regards motion, we may have paralysis or spasm, just as regards sensation we may have anæsthesia or hyperæsthesia. Situated as the larynx is at the entrance to the respiratory tract, impairment of its powers of motion, whether reflex, or local, is of the greatest importance.

Paralysis may affect either the adductors or the abductors of the vocal cords, the former giving rise to loss of voice, the latter to dyspnœa. Paralysis of the adductors is commonly functional, often associated with general debility, particularly in females, hence commonly called hysterical. When viewed by the laryngoscope, the vocal cords are seen, when the patient is asked to produce some vocal sound, to remain immovable or only to approximate imperfectly. Hence phonation does not follow. The patient is dumb, but involuntary and reflex movements are not interfered with. The muscles whose functions are impaired are the crico-arytenoidei laterales and the arytenoidei, but they usually respond promptly enough to the Faradic current, and this, in truth, is the best remedy for the disease, coupled with strengthening remedies, especially strychnine and iron. Sometimes there is paralysis on one side only, and this is a more difficult affection to deal with, being often due to interferences with the nerves concerned, central or otherwise, and then the reflex as well as the voluntary movements are suspended. In these cases the abductors are often more affected than the adductors on the same side.

Paralysis of the abductors is usually one-sided. Paralysis of both sides causes death if speedily brought about. In this condition the vocal cords lie motionless near the median line, causing great inspiratory dyspnœa and giving expiration a crowing character. The voice is not much altered. It commonly depends upon central disease involving the roots of both vagi, or on some local affection involving both recurrent laryngeals. In children the symptoms might be mistaken for spasm of the vocal cords, and the disease be confounded with laryngismus

stridulus; but in it the stridulous breathing *never* passes away entirely. It is very dangerous, not only as an indication of serious disease elsewhere, but also because in it a very little alteration in the size of the glottis might prove fatal. To obviate any such accident, tracheotomy ought to be performed as early as a favourable opportunity presents.

Paralysis of the abductors on one side is more common. Here, one vocal cord remaining near the median line immovable or nearly so, there is some stridor and dyspnœa, increased on exertion. This form of disease is usually symptomatic of injury to or pressure on the nerves supplying the muscles, very often from aneurism, or other form of tumour in the chest. Hence it is that it is of such evil omen, and as there is little hope of reaching the malady giving rise to the paralysis, treatment of the symptoms may be said to be useless.

Spasm of the vocal cords is a malady long since recognised by the well-marked characters of its symptoms under the title of *laryngismus stridulus*. The malady comes on in fits, during which there is complete or incomplete closure of the glottis, in the latter case accompanied by loud stridulous respiration. The exact seat of the irritation which gives rise to the muscular spasm is not known, and probably varies. It may be central in its origin, but is excessively common in the rickety state. It is almost exclusively a malady of childhood, and is most frequent during dentition. Enlarged cervical glands causing pressure on the vagus or recurrents has been assigned as a cause, but so have a multitude of other things. Probably, indeed, any form of reflex irritation which can act upon the recurrents may do so. In many cases, undoubtedly, the condition has been one rather of palsy than of spasm, and the two classes of cases have been confounded.

The attacks are most frequent in the night time. The child wakes up unable to respire for the time being; the glottis is closed. Presently it begins to give way, and loud stridulous breathing is heard. This goes on for a time, the child being greatly frightened, and livid. The vessels in the neck are swollen, the hands and feet are convulsed. These symptoms gradually pass away. The child may fall asleep, and next day be quite well. No hoarseness or loss of voice is left behind, for there is no disease of the larynx beyond the nervous affection. Recovery may be

complete, but very often there is a tendency to relapse, and sometimes death occurs on the first onset of the disease.

Treatment.—The great thing to do is to get relief to the symptoms of suffocation. To this end the child may be placed in hot water, and cold water dashed on its head; or the fauces may be tickled with the finger, so as to induce vomiting. If a medical man is at hand, he had better give chloroform, or if that is not available perform tracheotomy, and the last should always be done and artificial respiration tried, even if the child seem to be dead. During the fit the child cannot swallow, so it is useless to try to give medicine in that way, but some speak highly of enemata containing valerian, assafœtida, and other antispasmodics.

The attack being over, we must try to prevent another; hence undue exposure to cold winds should be avoided, the bowels seen to, any worms got rid of, any teeth nearly through scarified, and rickets carefully treated: in short, every means should be taken which suggests itself for the avoidance of reflex irritation which may find its in laryngeal spasm.

Neither hyperæsthesia or anæsthesia of the larynx are common conditions. Neuralgia of the larynx may occur as in any other part, but that is not hyperæsthesia. Hyperæsthesia moreover most probably expresses itself as reflex spasm. Anæsthesia may occur from disease of the vagus or its roots; it is of importance chiefly as rendering the patient liable to choking. The parts are insensible to the pressure of the morsel swallowed, and so the necessary reflex closure of the glottis may not take place. If at the same moment there is an inspiratory act, the morsel may be drawn into the trachea and death ensue.

DISEASES OF THE LUNGS.

BRONCHITIS.

Catarrhal inflammation of the air-passages is at all times a common malady, but in different individuals the predisposition as to its site varies exceedingly. In some the upper part, *i.e.*, the nares, the larynx, and trachea, in others the lower part of the air-tubes, *i.e.*, the bronchi, tend to be attacked. When the bronchial tubes are affected

the disease varies in intensity and importance according as to whether it occurs by itself, or as the complication of some other malady, and according to the size of the tubes implicated. Catarrh of the smaller tubes is always a more serious thing than a similar affection of the larger bronchi.

Bronchitis is most common in childhood and old age, and in the latter has a strong tendency to become chronic. It is hardly possible to define the causes which tend to make some more subject to bronchial catarrh than others, but many who apparently seem robust are very liable to its attacks. Those are of what it is customary to call a "soft fibre;" they readily fall ill and take much nursing to get well, such individuals being exposed to cold, especially in the form of a sudden chill, or when cold draughts and wet are combined, are very apt to acquire bronchitis. It is too a frequent and dangerous complication of many maladies, especially heart disease, causing obstruction to the passage of blood through the lung, and chronic Bright's disease, in both of which it frequently gives the *coup de grace* to the patient. In other diseases, for less known reasons, it constitutes one of the most invariable symptoms; such are influenza, typhoid fever, measles, and, in a less degree, small-pox. Certain irritants, as coal dust, iron in a fine state of division, stone-cuttings, and the like act as direct causes of bronchitis in those exposed to their influence by reason of their occupations.

Acute bronchitis affecting the larger tubes is commonly associated with catarrh of the trachea, and it may be of even higher portions of the air-passages. Most frequently the catarrh of the bronchi follows catarrh of the upper parts of the respiratory tract. If the malady is likely to be extensive, it comes on with a chill, or feeling of chilliness, followed by a sensation of heat, with no great rise of bodily heat as indicated by the thermometer. There may be, too, some delirium at night, especially in children, prostration, and pain in the back and loins, generally also in the limbs and joints, together with frontal headache and quickened pulse. There is a sense of burning pain beneath the sternum, always aggravated by coughing, which too is a constant symptom, and is followed by a feeling of soreness or rawness different from that just spoken of. The cough is not hoarse, except the larynx be implicated, and at first is always dry, for the secretion is for the time being arrested, but soon becomes more copious than natural. This secretion the patient spits up at first with difficulty,

for it is then exceedingly tenacious, consisting chiefly of clear, glairy, stringy mucus—the cause of much of the distressing cough. Later it is looser, and contains more formed elements floating more freely in serum, but still mixed with mucus in varying proportion. Usually the patient complains of being stuffed up in the head, but there is no great dyspnœa, for when the nares are choked the patient can breathe by the mouth. In almost every form of bronchitis percussion remains unaltered, except in the exceedingly chronic variety which has ended in serious lung changes. But the sounds heard are altered from various causes. In some cases the natural vesicular murmur, as it is commonly but erroneously called, persists and is alone heard, but it is common to have two modifications of it from two totally different sets of causes. In slight catarrh of the bronchi it is not uncommon to have a pellet of tenacious mucus form and adhere at the bifurcation of some of the larger tubes. This, moved to and fro by the current of air, exactly like the reed of a flageolet, gives rise to a humming sound, and may even cause vibration strong enough to affect the chest wall. This is essentially a dry sound, and may often be heard by the patient himself. It ceases when the small tongue of mucus is removed by coughing or otherwise, and then the ordinary breathing sounds are alone heard. The other kind of sound is moist; that is due to the presence of fluid. This is best marked in chronic bronchitis, where the expectoration is loose and very fluid. It may be represented by the sound produced in blowing soap-bubbles—air driven through a somewhat tenacious fluid. To both of those abnormal sounds special names have been given, but special names have been the curse of auscultation. The things themselves are what we should study. The distinction into dry and moist, when practicable, is, however, important. The former are known as sonorous bronchi; the latter as large, moist râles, or bubbling rhonchi.

Bronchitis of the kind here spoken of soon gets well, except there be some special cause for its continuance. The feet in hot water, a dose of Dover's powder (gr. x for an adult) or James's powder (gr. v for adult) with a good load of blankets, insuring a good perspiration, soon gives relief.

Catarrh of the smaller bronchial tubes, sometimes called *capillary bronchitis*, differs in many respects from the same malady as it affects the larger tubes. The py-

rexia is more marked, the cough more violent and tiring, and the difficulty of breathing, particularly in children, much more marked. The dyspnœa in adults tends to become periodical—*i.e.*, is due to spasm—but in children it is constant and very severe. There is no dulness on percussion, and little or no pain beyond the tired feeling alluded to. The sounds heard are the same in kind as in catarrh of the larger bronchi, but differ in degree; instead of a large volume of sound, the dry rhonchus is here sibilant or wheezing, whilst the moist râles are also smaller and finer, what are called subcrepitant, or fine crepitation. In fairly strong individuals even this form of bronchitis tends to get well in a few days, but in the weakly and aged this is not the case. Here the malady assumes a different type, due to the weakness of the patient, prostration rapidly supervenes, the mind becomes affected, the tongue is dry, and the teeth covered with sordes from elevated temperature. In short, all the signs of the typhoid state, as it is called, supervene, and the patient sinks, probably from the accumulation of the bronchial secretion, which he is unable to cough up. In children capillary bronchitis is quite as fatal, but in a different way. In them the air supply fails, the breath being no longer able to penetrate through the swollen tubes to the alveoli of the lung, where alone aëration of the blood can be effected, and so asphyxia follows. Children too cannot spit, and there is peculiar difficulty in clearing their air-tubes. Hence gradually the violent efforts to breathe and the whistling and wheezing noises heard all over the chest diminish, the surface becomes paler, then livid, cold, and clammy. At each inspiration the walls of the chest yield and are dragged inward; still more so is this the case with the epigastrium—a sure sign of imperfect filling of the lung by inspiration—till death comes on to end their misery.

Chronic bronchitis is one of the most common maladies of old age—in fact, few old men and old women are free from it in winter. In some the disease begins comparatively early in life; at first they have recurring attacks of acute bronchitis coming on with less and less exposure, especially in the winter time, but by-and-by the symptoms are persistent—sometimes better, sometimes worse, but never altogether leaving the patient. In this advanced stage the inflamed portion of the tubes may extend from the trachea to the most minute ramifications of the bronchi, and in some places gives rise to

important textural changes. In this form of the malady the expectoration varies greatly—sometimes very tough and difficult to get up, giving rise to prolonged fits of most violent coughing; but in others it is loose, copious, and easily got rid of, much to the comfort of the patient. Dyspnœa more or less permanent is a marked phenomenon in chronic bronchitis, often coming on in violent asthmatic paroxysms, which are mistaken for true nervous asthma. Emphysema too is commonly developed, with all the evils attendant in its train (see EMPHYSEMA), sometimes even cyanosis and dropsy. All kinds of unusual sounds are to be heard over the chest, varying in character from time to time, chiefly with the effects of coughing, and the quantity and quality of the expectoration. In patients whose bronchi have become dilated the secretion may be very great, and the quantity expectorated the first thing in the morning, after the accumulation of the night, enormous. For the same reason these patients generally have a violent fit of coughing the first thing in the morning as soon as they begin to move. The sputa lodged, too, in bronchial dilatations, frequently undergo putrefactive changes, so as to be not only exceedingly copious, but very fœtid, particularly unpleasant to the patient and those around him. Instead of the ordinary round corpuscles, such sputa contain the cell-forms broken-down and fatty, with tufts of fatty crystals.

Treatment.— As already hinted, some people are prone to catarrh of the air-passages, and such are generally intrinsically weak, though seemingly robust. Every means should be adopted to strengthen them, especially by exposure to a moderate degree of cold, exercise, cold-water baths, &c., in hopes of overcoming this predisposition. But in the very young and very old this would be absurd. For such patients equable temperature at a moderate height must be maintained, and even efficient ventilation must be sacrificed if necessary to afford this, if the patient cannot go to a warm climate. Rickety children are prone to bronchial catarrh, and in them the disease often leaves its mark in the shape of a pigeon-chest. Here treatment of the general condition is even more important than of the catarrh only. When dependent on mechanical congestion, as in heart disease, we must treat the heart affection as well as the bronchitis, and the same is true of Bright's disease. Where, again, bronchitis is part of a general disease process, as in some fevers, we may

strive to abate its troublesome character, but can hope for little relief till the general disease has run its course and the patient has otherwise begun to mend. When plainly due to direct irritation, it is useless to attempt treating the malady whilst the cause of it continues to act; the conditions of life must therefore be changed.

We are left therefore in the treatment of bronchial catarrh very much to those cases arising from accidental exposure to cold, or its chronic form. In the former our main remedial agents are heat and moisture. We must give the patient hot, moist air to breathe, so as to soothe his congested bronchi, and we must try to get his skin to act. Frequently heat and moisture alone suffice for this. The patient should have a warm bath, turn immediately into bed in hot blankets, and drink copiously of some soothing warm drink. Sometimes the wet pack is even more efficacious, leaving the heat of body to raise the temperature of the wet sheet. It is, however, common to aid these by other means, especially Dover's powder, or some preparation of antimony, but this is not absolutely necessary. By such means, and a diet of slops for a day or two, the patient will soon be restored; but restoration is, as before said, materially aided by hot, moist air for breathing. To this end a tent of blankets may be formed round the patient's bed, and the kettle kept boiling by the side of the fire, the steam being conducted to the bed by a piece of india-rubber tubing. If these means be not available or considered unnecessary, inhalation of steam from a jug of hot water or more formal inhaler, may be used. These may suffice, but they may not. The cough may be very troublesome and some sedative may be required. This should at all times be administered with caution, and is often quite inadmissible. Cough is the natural means of expelling the excessive secretion from the chest. The presence of this secretion acts as an irritant, and the soothing of this irritation by opium is only rendering the part less sensitive to what imperiously demands removal. It may, however, be used with advantage in the dry stage, while as yet there is little or no secretion, and will then give great relief; but beware of it with copious secretion and weakened bodily powers. Certain mineral waters, particularly those of Ems, are lauded by foreign physicians in the chronic stage, whilst we in this country generally limit ourselves in this direction to the exhibi-

tion of alkalies, in hopes of diminishing the extreme tenacity of the sputa. In the early stage too ipecacuanha and tartar emetic, given in small doses, are very valuable, especially in children, for in them the production of vomiting is the only way to clear the chest of phlegm, especially if at all tenacious. When the secretion is overcopious, a different kind of expectorant, more or less stimulating, should be used. Chief among these are senega and squill, used the one mainly as infusion, the other as tincture. Whilst of a still more pronounced kind are ammoniacum, myrrh, and the balsams; but these are chiefly used in the bronchitis of old people. It is difficult, perhaps, to class exactly carbonate of ammonia, though it is commonly given, with the last group. In some cases where the dyspnœa is extreme, much relief is obtained by allowing the patient to inhale small quantities of ether, at the same time that it is given internally along with spirit of chloroform.

The direct application of remedies to the bronchi by inhalation and spray is now possible. For inhalation the essential oils, as those of pine wood, turpentine, or tar, do good; whilst the use of lime-water as a spray promises to be of service. The oils should be used where there is much secretion and a tendency to putrefactive change. The lime-water should be used with a steam spray apparatus (Siegle's will suit), and is to be used when the sputa are clear, tenacious, and not very purulent.

CROUPOUS OR PLASTIC BRONCHITIS.

This malady differs in many important respects from the catarrhal form of the disease. It is not a spreading of croupous inflammation from the larynx into the bronchi, but is a distinct affection of the middle-sized tubes, resulting in the formation of casts of their walls, which are from time to time coughed up. Some of these casts are tubular, some solid plugs, and it is very rare to find the whole bronchial system involved, only a small part being usually affected. These cases are generally chronic, the patients improving from time to time. But the whole history of the disease is obscure and has not been fully studied.

BRONCHIECTASIS, OR BRONCHIAL DILATATION.

In long standing chronic bronchitis the lung substance, from indurative change of a chronic inflammatory kind as well as the tubes themselves, become seriously damaged; hence both the tubes themselves and the substance of the lung suffer. Portions of the lung substance thus become useless; contraction of these portions goes on at one part, with consequent dilatation at another. One of the results of these changes, especially where the walls of the bronchi have become weakened through the action of altered and excessive secretions, is dilatation of the bronchi at one or more spots. Such dilatations of course tend more and more to retain the secretion and so perpetuate the mischief. They are chiefly of importance from the putrefactive effects they have on the retained secretion, which in turn affects the neighbouring part of the lung; and from the fact that the passage of air through this retained fluid simulates the same thing in a cavity of tubercular origin, and may thus lead to a false conclusion except the whole facts of the case be borne in mind. See CHRONIC PNEUMONIA.

EMPHYSEMA PULMONUM.

By emphysema is meant an unusually great quantity of air either in the ordinary air passages and cavities of the lungs, or in the tissues surrounding and constituting these. Hence it is commonly divided into *intralobular* and *interlobular*, or *vesicular* and *extra-vesicular*, according as it exists within or without the ordinary air-sacs. The interlobular form is perhaps most common, as the result of surgical injury, as when the ribs are broken and penetrate the lung substance, but it may possibly be produced otherwise, as by violent straining or coughing. By rupture of the vesicles the air escapes into the tissue connecting them, and thence by the root of the lung into the general connective tissue of the body. An emphysematous appearance of this kind is also produced by the generation of putrid gases after death. In such cases it shows like rows of small beads beneath the pleura, marking out the areas of the lobules.

True vesicular emphysema may be of two kinds—*compensatory*, as where some of the vesicles dilate so as to fill out the chest after the collapse or consolidation of others; or *substantive*, where there is actual increase in the bulk

of the lung. But besides these, there is in *atrophy of the lung*, such as occurs in old age, a kind of emphysema with distinct shrinking of the lung substance. In this shrinking, septa give way and are broken down; alveoli coalesce, and capillaries become obliterated, so that the lung tissue is dry and bloodless. But the lungs are diminished, not increased in size, for the chest itself is shrunken, and the lungs do not fill the contracted chest. Hence it is that there is in old people a shortness of breath and a badly aërated state of the blood, even when they do not suffer from chronic bronchitis.

In true emphysema there is enlargement of the capacity of the lung at the expense of its elasticity. When any portion of the lung collapses, the capacity of the chest remains the same. To occupy the vacancy thus produced, a neighbouring portion of lung becomes permanently over-distended, to replace that which is collapsed. The mechanism of production may be various, but the result is in all cases the same—viz., that some portion of lung substance becomes vicariously and permanently over-distended by inspiratory force—*i.e.*, the pressure of the outer atmosphere. In another set of cases there may be no such incapacitation of any portion of the lung. Thus in those who have suffered long from hooping-cough, and who are of a relaxed fibre, and in those who have long suffered from winter cough, it is common to find emphysema of one part without, it may be, often collapse of another; and though that is in part of a vicarious character, still we may find in some an emphysema which is altogether substantive. Cough is essentially a series of violent expiratory acts with a partially closed glottis; it is easy to see, that while it lasts the pressure within the thorax is increased, by the reddened face and the swollen jugulars. The same thing happens in blowing wind instruments, and in straining. If now from any cause this strain falls upon any part of the lung which is weaker than another, that is likely to yield. As a matter of fact the upper lobes and free margins of the lungs do thus give way, and so we have localized distension. We have only to account for its permanency to account for emphysema. In all old people there is a tendency to degeneration which affects the lungs as well as other parts of the body, rendering them less elastic, and so when once over-distended less able to resume their normal state. A similar effect may be produced by repeated over-distension in younger individuals when the parts become

less elastic, in some instances at least from impaired nutrition. The lungs may thus become more able to resist strain, but less elastic and so less efficient in expiration, of which their elasticity, together with that of the ribs, is the main acting cause. If the elasticity of the ribs too be affected, as sometimes seems to be the case, even in middle age, expiratory power would be still further diminished, and so the lung tend to become permanently less and less emptied—*i.e.*, remain habitually over-distended when quiescent.

In the variety of emphysema again which is well named large-lunged emphysema, we often find such a history as follows:—A patient weakly from infancy early suffers from cough, particularly in winter time; it comes easily and is hard to get rid of. By-and-by it occurs in summer, and ultimately it becomes almost permanent. With the cough there is latterly copious expectoration, muco-purulent in character, and there is marked shortness of breath. When seen in the later stages, the chest will be found fully distended and inclined to be barrel-shaped, this being brought about partly by bending of the spine, partly by elevation of the ribs nearly to the horizontal level, and partly by arching of the sternum. The intercostal spaces are wider than usual, the heart is pushed downwards, and its impulse is best seen in the epigastrium. The shoulders are high and the muscles of the neck prominent. Generally the supraclavicular fossæ are drawn in by inspiration, but in coughing it may be they are over-distended, and become resonant, even to the angles of the jaws. The veins of the head, neck, and upper extremities are unduly prominent, and are rendered still more so by coughing. Sometimes the blood seems to collect in the jugulars during expiration, and to be drawn in by inspiration to a marked extent. The face is dusky, the lips blue, the alæ of the nose thickened, the eyes prominent and yellowish. There is drowsiness and mental dulness. The patient can only sit upright, and even then breathes with difficulty, especially, as often happens, when bronchitis is superadded to the emphysema.

On percussion the chest is preternaturally resonant, owing to the increased quantity of air contained in it, and the tension of its walls: consequently it *drums*. The space ordinarily occupied by the heart and yielding a dull resonance, is now covered with lung, and so gives forth a clear note; and as the diaphragm is flattened and is lower than usual, the percussion sounds are clear to a

much lower point than usual, both in front and behind, reaching sometimes to the margin of the ribs. The sounds on auscultation vary greatly, being often those of bronchitis; but as due to the emphysema we find short and feeble inspiration, long and feeble expiration. As a consequence of this condition of the respiration the patient is unusually short-winded on the slightest exertion, and this is perhaps the first sign which tells the patient his lungs are no longer what they were. The condition of the lungs explains this: they are permanently over-distended. They contain enough of air, but it is not changed sufficiently often. The patient is unable to expel that already contained in them, and consequently can take in little new and fresh air. So the patient labours to inhale more air: the muscles of his neck lift the chest, and the diaphragm descends to increase its capacity from above downwards, but they cannot dilate it to any great extent —that is already done: and so there may even be drawing-in of the intercostal and supra-clavicular spaces with each inspiration; at the same time the alæ nasi work, and every effort is made to secure enough of breath for the wants of the body.

Nor does the interference affect the respiration alone: the circulation is also affected. One great cause for permanence in the over-distended condition of the lung is the change in its texture due to obstruction to the circulation, and this obstruction is in turn brought about by the lung changes. By the over-distension of the air-vesicles the capillaries on their surface are compressed and obliterated, and if not so, are, at all events, lengthened and probably narrowed. Again, the new connective tissue which developes as the consequence of the congestion of some parts, tends after a time to strangle the capillaries, and at all events by thickening the parietes of the alveoli renders them less fitted for aëration. Moreover, the violent fits of coughing which sooner or later supervene, prevent at once the flow of blood through the lungs to the heart and its return from the veins.

In all these ways the passage of blood through the lung is obstructed, and no other passage from the right to the left side of the heart is possible; so therefore to force a way for the blood through the altered lung the right heart becomes hypertrophied, or, unable to overcome the obstruction, both hypertrophied and dilated, and its valves incompetent. Then follow all the evil consequences depen-

dent on such dilatation. The veins of the neck pulsate and fill from below, the liver enlarges and hardens, so do the kidneys, the proper tissues giving place to useless connective tissue, and the legs swell from obstructed venous circulation. The blood, aërated or not, reaches the left heart through the lungs with difficulty, and so the pulse is at all times small and feeble. After a time the left ventricle may become hypertrophied.

As a consequence of the bad aëration there is cyanosis, even apart from the venous congestion, so that the patient may be absolutely blue, and headache is much complained of. But patients rarely die from cyanosis; most frequently the cause of death is dropsy or bronchitis.

After death, on opening the chest, the lungs do not fall back as usual, but remain prominent, or even protrude from the chest. The dilated portions are lighter than the rest, but here and there are black spots, generally the remains of capillaries and their altered contents. The lungs feel drier and softer than natural, and if cut across the enlarged cavities are sometimes seen, especially at the margins and apices, the parts most frequently affected. Most frequently along with the emphysema there are marks of bronchitis.

Treatment.—Emphysema is best avoided—it cannot be cured. Hence arrest all coughs as soon as you can, and avoid bronchitis, which is one of the most troublesome and evil of complications. Keep the patient quiet by all means and tell him to avoid all possible exertion. Compressed-air baths give great relief to the emphysematous, so do rest and quiet in a tolerably warm room. Diet must be carefully attended to. Inhalations of a sedative kind in bad attacks are of great service, ether being the most valuable we know. Otherwise the treatment is that of chronic bronchitis.

ASTHMA.

By asthma is meant a paroxysmal dyspnœa recurring at intervals, and not necessarily associated with either pulmonary or cardiac mischief. During the intervals between the attacks too the patient is fairly well, and can breathe easily and comfortably. Certain forms of the disease are, however, symptomatic, or dependent on causes constantly acting—as in bronchitis and heart disease—though only occasionally manifesting themselves in this shape. It is exceedingly important to bear these distinctions in mind.

It is therefore on the asthmatic paroxysm as in some degree common to the two that we must specially dwell. Besides the paroxysm, however, there is the general asthmatic condition, and as long as that exists, apparently trivial causes may bring on an attack. This general condition is sometimes due to some of the diseases of childhood, as measles and hooping-cough; in others the only cause we can assign is inherited taint. But in some apparently otherwise healthy individuals certain substances when inhaled suffice to set up an asthmatic paroxysm. The inhalation of sulphurous acid, chlorine, and other irritant gases will set up a considerable amount of dyspnœa even in healthy individuals; but in many, much simpler and less harmful substances will have the same effect. Thus the emanations of hay when in flower bring on what is called hay-asthma in some. In others, dust will have the same effect; so too will the emanations of some flowers, as roses. Still more common is the susceptibility of individuals to certain animal effluvia —cat-asthma being one of the most frequent of these. Dogs and horses have a similar effect on some. Rabbits, hares, guinea-pigs, and ferrets all influence certain individuals in the same way. The atmosphere exercises a peculiar influence over asthma. Thus it may be induced by too high a locality, or by too low a locality. As a rule, the air in low, moist situations is better suited to the asthmatic than is that which is high and dry. One of the most common peculiarities of asthma is this—that as a broad rule a smoky city atmosphere is better for an asthmatic than one which is ever so pure in the country. Again, asthma is frequently brought on by food, though in some only certain kinds of food do so, in others anything. Wine very often acts thus. In all asthmatic individuals inflammation of the bronchi is a serious complication, for when thus irritated, the asthmatic paroxysm is with more than usual readiness brought about, and is of unusual violence.

However induced, the asthmatic paroxysm may occur with or without warning. Sometimes people know of its approach by certain unusual sensations of various kinds—it may be excitement, it may be depression, or it may be an unusually free discharge of limpid urine. But as most attacks of asthma occur in the night-time, the patient being suddenly awoke by it, so in most there is no warning whatever. If its onset be watched, it is found to begin with some dyspnœa, a short, dry cough, and

a slight wheezing at the chest. There is some constriction, due in part to what appears a distension of the stomach by gas, but may be only depression of the diaphragm. This may last as long as a day or two before the attack breaks out, which it does by gradually increasing constriction and wheeziness. In other cases the attack seems at once to attain to its maximum intensity. As already said, attacks of asthma are most common at night, or rather in the morning between two and three o'clock, or thereby, each patient having a certain stated time to which the commencement of the attack closely adheres. Another favourite period is about two hours after dinner. The forenoon is always the best part of the day with asthmatic sufferers. In the attack the attitude of the patient is striking; generally some posture is taken, whether sitting or standing, which will enable the great muscles available for respiration to be called into play: the throat is straightened as much as possible, and he will remain at the open window in the worst weather. The face is pale and dusky, the extremities cold, and yet the surface is streaming with perspiration. With all this violent action there is little motion in the chest, nor are the respirations increased in number. The inspiration too is very short, the expiration prolonged. With all, there is little sound of air passing to and fro in the air-tubes, except in the form of dry whistling and wheezing sounds, mostly expiratory, but the true respiratory murmur, even in the absence of these, is not heard. In some cases only certain portions of the lung are affected, and where unaffected, whilst the wheezing sounds are absent, the respiratory murmur is unusually loud. These affected spots change their site from time to time, as if first one part of the lung became implicated, then another. Percussion too is unnaturally clear over the affected lung, while the intercostal and supra-clavicular spaces are drawn in with each inspiration.

In many cases the attack passes away, with the expectoration of some particles of grey transparent mucus; not that the expectoration gives relief, but it shows that the end is approaching when expectoration becomes possible. Much more rarely blood is brought up. If the attack has been protracted, lasting one or more days, it usually departs gradually; if shorter, say from five to six hours, much more abruptly. The influence of remedies on the disappearance of the paroxysm is very marked. An attack of this kind is generally followed by

a period of relief; thus in hay-asthma the individual may be ill all the time the grass is in flower and quite well the rest of the year.

The immediate cause of the asthmatic paroxysm is spasm of the smaller bronchi, preventing the air from either getting in or getting out, but this may arise from various causes. The action is reflex. The irritation which causes the nerve centre to act, may be anywhere, in the lung itself, in the stomach, the uterus, or the rectum. Given an unusual susceptibility on the part of the bronchial muscles and the guiding nerve centre, and any kind of irritation applied to any part of the body may set up the asthmatic paroxysm.

Treatment.—Such being the nature of asthmatic attacks, the duty of the practitioner becomes twofold; he must do his best to avert or weaken the force of each attack, and try to prevent its recurrence. If the cause of the attack can be known and is removable, that should at once be done; but often this is not possible. Usually the patients instinctively place themselves in the easiest posture, which to most is sitting with the arms leaning on something in front of them sufficiently high to raise the shoulders, and so enable the great muscles to act with more power. But the question what to do for them is not so easy, one kind of remedy suiting one patient, another another. In this, as in other forms of muscular spasm, a pipe of strong tobacco, smoked till nausea begins, may give complete relief. So too may nausea induced in other ways, as by ipecacuanha, even short of vomiting, though when the attack has been brought on by something eaten, emptying the stomach is of the greatest service. To this end the vinum ipecacuanhæ should be given in ʒj doses till nausea, or, if desired, vomiting be induced. Lobelia inflata and Datura are both favourite remedies for asthma. Of lobelia, the ethereal tincture is used, and it should be employed in gradually increasing quantities, beginning with ♏ 20—30 doses and repeated every half-hour till nausea comes on. Two species of Datura are used, the D. Stramonium and the D. tatula, the former being the better known. They are used either in pipe or as cigar, or given internally as tincture. They are certainly much more efficacious when smoked, and for some patients constitute at all times a sovereign remedy. They are of the greater value, as if smoked early they may possibly cause the attack to prove abortive. Another remedy well worth trying is atropia; this given subcutaneously, or even administered

internally in the comparatively crude form of tincture of belladonna, often gives relief. Of still more value when the paroxysm is fully developed is the inhalation of chloroform and ether. The spasm may recur as the effects of these wear off, but this is not always the case; of the two ether is the better, as being safer and capable of being entrusted to attendants, which chloroform should not be. Frequently a single drachm inhaled from a handkerchief may stave off an attack; it is too safer, when cardiac dyspnœa exists along with the asthma or is mistaken for it. One of the oldest and best remedies for asthma is the fumes of burnt nitre paper. These are often wonderfully efficacious, though on what principle it is hard to say. It may be used either as a preventive or a remedy; in both ways it is of use. A good plan is to burn some before going to bed every night, so as to have the air of the bedroom saturated with the fumes. Coffee taken strong and hot and black, is an excellent remedy in a paroxysm, but it should have these three qualities; hot spirit and water too does good. To completely overcome the malady there seems only one way—to find out the climate which suits best, and to stop there.

INFLAMMATION OF THE LUNG SUBSTANCE.

ACUTE OR CROUPOUS PNEUMONIA.

Inflammation of the lung substance, *i.e.*, of the air-vesicles of the lungs and their component tissues, is of various origin and kinds. Pneumonia is either *acute* or *chronic*, according to its course, but there are many other divisions or classifications. Thus *acute sthenic* pneumonia, called in Germany *croupous pneumonia*, is the most common form; but *broncho-pneumonia*, or *catarrhal pneumonia*, is the variety most frequently seen in children, and associated with bronchitis. It may also be *primary* or *secondary*; it may affect the *vesicular structures* or the *interstitial substance*, thus giving rise to another classification, though *interstitial pneumonia* and *chronic pneumonia* are very much the same thing. Finally, pneumonia is spoken of as *lobar* when it attacks a lobe or great division of the lung; and *lobular* or *disseminated* when affecting only small isolated patches or lobules. These various terms can hardly be correlated with exactitude, but acute pneumonia, croupous pneumonia,

and lobar pneumonia are very much the same thing. Neither can these forms of disease be exactly defined and separated from catarrhal or broncho-pneumonia, which is also lobular or disseminated pneumonia. The very nature of pneumonia is a matter of dispute; some hold it as a kind of fever, the inflammation of the lung being one of its specific characters; others hold that the fever depends entirely on the local change. What is called secondary pneumonia is often part and parcel of some disease, as continued fever. Very often secondary pneumonia is *latent*—that is to say, indicated only by the physical signs; but in others it is as marked as in ordinary sthenic cases. Secondary pneumonia is most frequently of the croupous kind, but in children and old people, especially if preceded by pulmonary collapse, it may be catarrhal. These terms croupous and catarrhal are not exactly accurate, seeing that in the air-vesicles of the lung there is no mucous membrane, to an inflammatory affection of which alone such terms strictly apply; but they are convenient as indicating the kind of inflammation, though neither clinically nor pathologically can any very strict line of demarcation be drawn between the two.

Pneumonia of the *acute* or *croupous* kind is commonly supposed to be in great part due to the influence of cold, but this is hardly right, though exposure to cold and wet and to variations of temperature are undoubtedly causes of its occurrence in weakly subjects. It is more frequent and more fatal among young children and people over sixty than in middle life. Males are more prone to the disease than females, perhaps owing to greater exposure in their avocations. Occasionally pneumonia seems almost epidemic. It may be due to direct irritation of the lung, especially through the bronchi. Pneumonia may also occur as a complication of other maladies, or is the mode in which they tend to terminate fatally. Thus it is often part and parcel of the typhoid state, especially in true typhus and typhoid fevers, in acute rheumatism, Bright's disease, &c.; whilst the variety called catarrhal or broncho-pneumonia is most frequently observed to follow bronchitis, especially in measles and as a consequence of collapse of a portion of lung.

Acute pneumonia comes on, sometimes after a slight degree of uneasiness, with headache, loss of appetite, and so on; but much more frequently it begins suddenly with a well-defined rigor which at once marks the onset and in a certain way the kind of the disease, for in few maladies

except pyæmia and ague is this rigor so well marked. As in other diseases, a convulsion may take the place of a chill in childhood. In broncho-pneumonia this chill is often entirely absent, as it may also be in other forms of secondary pneumonia. In both forms of the malady, however, there is prompt rise of temperature to 103° F., or even higher. Pain in the side too, as a rule, is an early symptom, particularly on coughing, but may sometimes be absent. This pain is probably due to some slight pleurisy, and is usually felt over the affected spot. Within twenty-four hours of the rigor other symptoms show themselves. The face becomes flushed, but with a dusky redness; there is great prostration of strength, and complete loss of appetite. The breathing is quick, even 40 or 50 per minute, and shallow, it may be painful. Speech is interrupted or broken. There arises a short hacking cough, which gives great pain, and is speedily accompanied by viscid, tenacious, and bloody sputa. The blood is intimately mixed with these sputa, and according to its amount the colour of them varies, but is usually brick-red or earthy. The pulse is quick, from 100 to 120, soft as a rule, and even dicrotous, though in the early stage it may be full and strong. The skin is usually dry; the tongue furred, the bowels confined, the urine scanty and high-coloured. Herpes on the face, especially the upper lip, is frequently a symptom in pneumonia.

On a given day, which may be any one between the third and tenth, but generally on the seventh, the severity of the symptoms abruptly ceases, and improvement begins; the crisis being usually as well marked as is the onset. Of course it may end in both ways, in death as well as in recovery; but in ordinary uncomplicated cases the tendency is to recovery. Such is a brief sketch of a case of croupous pneumonia.

Inflammation most frequently attacks the lower lobe of the right lung; most frequently, too, only one lung is affected, but sometimes both are so, the pneumonia being then called *double*. If the lung is tubercular the upper lobes may be first affected; but still this is more common on the right than the left. This mode of attack is most frequent in weakly individuals and in those who have damaged or tubercular lungs. The parenchyma—*i.e.*, the air-cells and substance of the lung, is the part attacked, and goes through various stages of inflammatory change. First is that of *engorgement*, where

the blood-vessels are over-full; the colour of the lung substance deep red in tint; the lung heavier, firmer, and non-elastic, whilst a tenacious bloody fluid oozes from the cut surface, but the vesicles still contain air. In the second stage, that of *red hepatization*, this is no longer the case. The lung is completely solid, and sinks in water; it is no longer crepitant, but its substance is exceedingly friable, breaking down on slight pressure. Its section is granular, reddish-brown in colour, but not uniformly so, being marbled with lighter and darker spots due to divided tubes, containing inflammatory products and pigment. The granular appearance is due to the filling of the air-vesicles, mainly with transuded and altered white and red blood corpuscles, exceedingly little fluid being present. It is more marked in adults than in children, their alveoli being larger. The longer the hepatized stage continues, the less marked is the red colour. The granular appearance too is less marked, and so by degrees the lung passes on to the stage of *grey* or *yellow hepatization*. The tissue is now soft, and yields on scraping a greyish or yellowish puriform fluid, its quantity varying with the amount of serum present. The next stage is characterized by still further changes in the same direction. It is variously denominated *purulent infiltration* or *suppuration*, the better term being the former of these. In this stage the granular appearance is entirely lost, the lung substance being now filled with diffluent instead of solid materials, these having undergone liquefaction. The cell forms too are more fatty, and floating more freely, give the fluid expressed from the cut surface more of a puriform character. Still the elastic lung tissue remains, and after removal of the softened material is capable of being restored to usefulness. This process of recovery is called by some a stage of *resolution*, and consists in the gradual absorption of liquefied and fatty matters, or their partial ejection by expectoration, ending in the more or less complete restoration of the lung.

Complete breaking down of the lung tissue, and the formation of an *abscess*, is rare. When it occurs the blood supply being cut off, the tissues so deprived of nutriment die, and break down, the whole, together with the cellular elements already congregated within the part, forming an abscess surrounded by a wall of the yet living lung tissue. These abscesses vary greatly in size, the larger being due to the coalescence of several smaller ones. *Gangrene* is still

rarer as a termination of pneumonia. It is due to the complete isolation of a considerable tract of lung substance from any blood supply, the borders being generally in a state of grey hepatization. This slough breaks down, and a cavity filled with dark putrid fluid, of an excessively fœtid character, is thus formed. Something of the same kind may occur in the pneumonia of debilitated subjects, without any distinct sloughing, the grey hepatized lung passing rapidly into decomposition.

We are now in a position to enter into the rationale of the symptoms already mentioned. The initiatory signs are common to this and other acute maladies, though the rigors are more than usually marked, whilst partly to the lung changes, partly to the general alteration in nutrition, are due the high temperature (102-105°F.) so early manifested. The lung being gorged and its alveoli becoming rapidly choked up, the part so affected ceases to be of any use for respiration, and so the parts which remain available must be used more frequently. Hence the increased rate of breathing to 40 or 50, even 60, respirations per minute. At the same time the heart's beats are not multiplied in like proportion, and so the ratio between the two is altered—an important sign. Besides being quick the breathing is shallow, and the cough is, as far as possible, restrained. This is most marked when pain is most marked, and is due to the desire of the patient to avoid the pain of breathing or coughing. The sputum is similar to the material which collects in the alveoli, but with an additional admixture of tough viscid mucus from the smaller bronchi next the alveoli, which are usually implicated in the inflammation along with the alveoli. Hence the sputum is tenacious, and contains blood and cell-forms derived either from the walls of the alveolus or the blood-vessels. In some cases, instead of the ordinary brick-red sputum, it is dark and what is called *prune-juice* sputum. This appearance is due to alterations in the blood effused, and indicates a grave form of the malady. Expectoration may be absent in adults, and as a matter of course is always so in infants before they are taught to spit. Later on in the stage of grey hepatization the sputa become more diffluent, no longer contain unaltered blood corpuscles, but contain pigment, and are more purulent—*i.e.*, contain more free cell forms of the pus type.

The alterations in the lung give rise to certain im-

portant physical signs; those of the early stage being not so characteristic as those found later. However, at an early period the walls of the alveoli, and smallest bronchi, are covered with the viscid exudation already spoken of. In expiration these walls are brought together, and owing to this viscidity tend to adhere. When separated by inspiration a small, sharp crackling sound is produced, called *small* or *fine crepitation*. This sound is likened to rubbing a lock of hair between the fingers close to the ear, but is better simulated by squeezing a piece of dry india-rubber sponge, and allowing it to expand close to the ear. With the filling of the air-vesicles this sound ceases in the consolidated parts, or it does so even before that time. On percussing the lung there is dulness where there ought to be resonance, and the vesicles being no longer permeable by air, the vesicular murmur of normal respiration, as it is called, ceases to be heard; in its place we hear the louder sound produced by the air traversing the bronchi. This, which is not ordinarily heard, save in certain parts, is called *bronchial*, or if louder and more metallic *tubular*, *breathing*: the corresponding voice sound is termed *bronchophony*. If, however, the bronchi contain fluid, the coarser râles of bronchitis may at an early period be mixed with the finer râles of pneumonia, and they are also heard later, during the process of resolution, but even then the sounds may be very fine—*crepitatio redux*. During the period of consolidation we find that not only are voice sounds better conducted to the ear, their vibrations are also better transmitted to the hand laid on the chest wall. This is known as increased vocal *fremitus*.

The pulse, we have already pointed out, is quick, but not in proportion to the respiration; it usually varies from 100 to 120. This quickness is in all probability due in part to the effects of the overheated blood on the nerve centres. Its weakness is due in the later stage partly to want of power in the left ventricle, partly to want of pure blood in it, for the same reason the blood being imperfectly aërated, a blue tint of the lips is observed when much of the lung is implicated. Occasionally jaundice appears, and in some cases nervous symptoms are predominant. This is especially the case in the subjects of chronic alcoholism. The urine is diminished in quantity, and increased in specific gravity. This is owing to increase of the urea; the salts, and especially the chlorides, being markedly deficient.

As already indicated, the malady tends to a crisis, commonly on the odd days, from the fifth to the eleventh, especially the fifth and seventh; but this is by no means an invariable rule. Sweating is the most common critical phenomenon; whilst the pulse falls and the temperature sinks to the normal or beneath it. But even now relapse is possible. Pneumonia does not, however, always end in this favourable manner; it may terminate in death, especially if secondary, as in Bright's disease, at various stages and from various causes. Thus death may result from intense prostration, or increasing dyspnœa. So, too, death is apt to follow the development of abscess or gangrene.

Treatment.—Not many years ago no man would have ventured to treat a pneumonia without blood-letting: nowadays no one would think of having recourse to such a practice. Thus views change, the malady remaining much the same. In point of fact, as already stated, the primary malady tends to end favourably within a certain time, often only a few days after the rigors, and so all conclusions drawn from the effects of remedies within that period are apt to be fallacious. Sweating, which often proves so beneficial in bronchitis, is useless in pneumonia, and so are many remedies popularly believed to be efficacious. Upon the whole the best results are obtained by preserving a moderate and even temperature around the patient, and enveloping him in hot or cold compresses or poultices—the last being particularly useful in children. The cold compress may be used in this way: a folded sheet is wrung out of cold water, and wrapped round the patient till reaction takes place; or the whole chest may be enveloped in a jacket poultice. This is a safe treatment. Some prefer to change the cold compresses frequently, at least every few minutes, and thus reduce the temperature; but except the temperature tend to rise to or above 105° F., and there are signs of poisoning of the nerve centres from overheated blood, this is unnecessary. When, however, this is the case, sharper measures should be had recourse to, as cold baths, wet-packing, and the like. Tartar emetic, and all forms of antimony, have been long used in pneumonia. Nowadays, except in very acute cases and in strong individuals, it is rarely employed; in weakly individuals its use is quite inadmissible. Veratria and veratrum viride, remedies which act in a somewhat similar fashion, have also been recommended. At all events they tend to diminish the frequency of the pulse, if that is the thing

to be desired. Another remedy, digitalis, has been used with somewhat similar effect, and so have a score of others. Not one of these are we prepared to recommend. Keep the patient quiet, feed him on slops, put him in a poultice, and see that the air he breathes is warm and unirritating, and give him an effervescing saline, as citrate of potash. Thus you may wait in ordinary cases for the crisis. Night and morning, or even oftener, the temperature should be taken. If it shows a tendency to rise over 105°, means must be taken to lower it in the shape of cold compresses or packs. So too the pulse must be watched, and the general condition of the patient carefully observed by the skilled eye of the practitioner. If there be signs of failing strength stimulants and nutritious food, bark, and ammonia must promptly take the place of slops, and be given in no stinted quantity, whilst in bad cases with prune-juice sputa, there is nothing so good as the liq. ferri perchloridi, in ♏40 doses every four hours. The same remedy may be used with advantage in the pneumonia of all debilitated subjects. Just as stimulants should be abstained from in ordinary simple cases, so when given they should be given liberally in the form of good old well-matured wine, and not as cheap pernicious stuff; rather give brandy or whisky than these, then you know what you are doing. When the crisis comes, judgment in these things is very necessary, but such judgment only comes of experience. In convalescence, iron and quinine, nitro-muriatic acid and chiretta, phosphoric acid and strychnia, and even cod-liver oil may be given. Sometimes these will do good in the adynamic forms of pneumonia, but less than good food and wine will do. Counter-irritation is only to be used if there be pleurisy, or if the lung does not clear up, then painting with iodine and a hot-water compress are the best remedies.

CATARRHAL OR BRONCHO-PNEUMONIA.

This variety of pneumonia is more especially a disease of childhood, but may occur at other and later periods of life. It is almost invariably preceded by capillary bronchitis, which is most apt to occur in children the subjects of measles or hooping-cough. Broncho-pneumonia is very frequently brought about by collapse of a portion of lung, as a result of bronchitis. It is also common in influenza. Brought about in this fashion, catarrhal pneumonia tends

to affect only small portions or single lobules of the lung, and hence occurs in disseminated patches instead of affecting large tracts. It is accordingly characterized as *lobular*, in contradistinction to the more severe or croupous form, which is termed *lobar*.

The malady begins in a bronchial catarrh, which in badly nourished children tends to spread. The occurrence of the pneumonia is attended with no rigors, but the dyspnœa increases, the breathing quickens, the child is restless and shrinks from coughing, and, above all, the temperature rises. In a simple bronchitis the temperature, even in children, seldom reaches 102°, but with the accession of pneumonia it speedily rises to 103°, 104°, or 105 F. The pulse also quickens, and signs of the local change may be elicited by physical examination, but these are not very definite at first, owing to the disseminated character of the consolidation. Both lungs are usually affected, and the bases posteriorly are first attacked. As collapse precedes the alveolar change, so the sounds elicited by percussion are at first those of a collapsed lung—*i.e.*, are less intense and rather more tympanitic than in pneumonic consolidation; but in the advanced stage the signs of catarrhal and croupous pneumonia are the same. They begin differently: the catarrhal form begins symmetrically behind and extends forwards very gradually, whilst the croupous or lobar form begins at one spot, and tends to spread thence unsymmetrically. Catarrhal pneumonia rarely progresses very rapidly, though sometimes it ends fatally in a day or two. Neither does it end abruptly, but gradually, the temperature first showing a tendency to morning remissions of two or more degrees. This mode of termination may distinguish between the two forms of pneumonia if other signs have been wanting. Recovery is always slow, and the consolidation very persistent. Death may result from dyspnœa arising from extensive collapse and consolidation, or at a later period from gradual exhaustion and wasting.

The appearances seen after death vary greatly with the period at which it occurs. In the early stage we have marks of bronchitis in reddened and thickened tubes, sometimes there are well-marked dilatations. The pneumonic spots are small, hard, wedge-shaped points, especially if on the periphery. They do not rise above the surface, and the section is uniform, not granular. The colour in the early stage is red, later whitish or yellowish,

owing to the development of epithelial products and their fatty degeneration. The changes in the collapsed lung can easily be traced from the stage whilst it is yet capable of dilatation, on to the period when its substance is completely altered, so that the whole may present a pale and bloodless appearance with marked increase of the interstitial tissue. Between these are all kinds of intermediate characters.

Treatment.—Originating as it does, the early treatment of broncho-pneumonia resolves itself into that of capillary bronchitis, in which, especially in children, emetics of ipecacuanha are of the greatest service. The vinum ipecacuanhæ may be given in teaspoonful doses till the child vomits. Hydrochlorate of ammonia too is useful. It must be remembered that this malady is essentially one of weakness, hence support and stimulants are absolutely necessary. The repeated application of cold compresses to the chest is highly commended, as tending to diminish temperature and otherwise contributing to improvement.

CHRONIC OR INTERSTITIAL PNEUMONIA.

In chronic pneumonia the changes affect not so much the epithelium of the alveolus, as the connective tissue constituting its walls. These walls gradually become thickened and fibrous, at the same time that the interlobular tissue is increased in amount. Thus the bulk of the solid part of the lung is increased, and the space available for aëration in the alveolus diminished. There is never any real exudation, but in the early stage the newly-formed material is soft and vascular, though later hard and tough, as in all cicatricial tissues. At the same time shrinking of the lung takes place, so that to occupy the whole chest space, we find dilatation of the bronchi, and falling-in of the chest wall as compensation for this shrinking. This bronchial dilatation is further favoured by the change which takes place in their tissues owing to the collecting of stagnant and putrid fluids in the dilated spots, these also favouring the interstitial changes in the lung substance round about the dilatations.

It is a question how far this form of pulmonary change is primary. Certainly in many instances it begins as catarrhal or even croupous pneumonia (though the latter is the rarer event), as bronchitis, as pleurisy, and as the direct result of collapse. Catarrhal pneumonia, as we

have already seen, may give rise to bronchial dilatations, and these being once established the chance of perfect recovery is very greatly lessened. We have only to take into consideration the possibility of the persistence of the two, to understand their final result in pulmonary induration. In this case, cause and effect are constantly acting and reacting on each other. One curious feature, however, is the singular tendency of such forms of lung malady to remain unilateral. Pleurisy may set up interstitial lung changes directly and indirectly: directly from the thickened pleura itself compressing and in a certain sense infecting the superficial alveoli; indirectly from producing pulmonary collapse of a more or less permanent kind. Tubercular deposits are also assigned as causes of such change: certainly in chronic phthisis induration is a prominent feature. Finally, the condition may result from direct irritation, as in miners, potters, grinders, stonemasons, and others exposed to the inhalation of irritating particles of dust.

The signs of chronic pneumonia in the early stage are those of protracted pneumonia of the common kind. There is dulness and other indications of pulmonary consolidation, but there is no certain sign of its character till the side begins to fall in and the bronchi to dilate. There may be some degree of fever and often there are wasting night-sweats, but for a long time there may be but little indication of constitutional disturbance beyond dyspnœa on exertion. Moreover, there is slight cough and scanty expectoration, whilst the chest on that side is permanently dull and the respiratory movement very slight. The degree of falling-in of the chest-wall is not so great in simple cases of chronic pneumonia as in chronic pleurisy after effusion, nor is the displacement of the heart and viscera so great; but the supra-clavicular fossæ are generally deepened and the intercostal spaces depressed, except there be compensatory emphysema. With bronchiectasis the signs alter somewhat: the sputa are more abundant and often fœtid, and usually of a greenish or bluish tint, or, if more copious, yellowish. Hæmoptysis is a common symptom, and the signs of an obstructed pulmonary circulation are seen more rarely in distended jugulars and cutaneous veins, with dilated right heart and small, feeble pulse. With such symptoms cyanosis is also occasionally present. Hence it is too that dropsy from obstructed pulmonary circulation is common, taking the form of anasarca, however, rather than that of ascites.

If the bronchial dilatation is close beneath the chest-wall, it yields an unusual degree of resonance on percussion; sometimes that is amphoric. Auscultation gives a blowing or bubbling sound, according to the condition of the cavity, whether moist or dry, whilst bronchophony or even pectoriloquy may be made out; but the profuse fœtid expectoration, not continuous but occurring at varying intervals, is the best sign of the existence of such bronchiectasis.

Such forms of disease, though exceedingly chronic, tend invariably to death by hæmoptysis, dropsy, diarrhœa, general wasting, or intercurrent disease of the opposite lung. Then the appearance of the diseased lung is found to vary greatly with the date of the mischief. The parts may be red or grey according to the stage. If recent, then the new tissues, though hard and tough, will still be red, but later they become steel grey and still harder and tougher, and are now comparatively bloodless. The textures are at first partly fibrous, partly corpuscular; later few corpuscles are found, and the new tissues are greatly shrunken. In some forms, especially in that arising from dust and grit, the tissue may be dark, almost black. Secondary inflammations in the new tissue are common—at all events we frequently find them broken-down and forming cavities which tend to assume a gangrenous character. These are most commonly associated with bronchiectasis and frequently spread from these more or less directly.

Treatment.—The treatment of chronic pneumonia in the early stage is mainly directed to getting rid of the consolidation. Here change of air is of prime importance. So too are good food, cod-liver oil, and a moderate allowance of stimulants—none better than good bitter beer. The change of climate should be to a dry, temperate locality where exercise in the open air is always practicable. A slight opiate will often relieve the cough, but it should be given in the morning rather than at night, as night sweats are to be dreaded. Great care should be taken of the digestive powers, and flying blisters very often repeated, or painting with iodine, will materially promote the absorption of the pneumonic deposit.

Later we can only palliate. Hæmoptysis is always to be dreaded and promptly dealt with by absolute rest, gallic acid, and acetate of lead. Diarrhœa must be checked by lead and opium. Expectoration must also be kept in check, for it is very weakening, by inhalation of pine-oil, oil of turpentine, or creasote; and port wine, iron, and

bark should be given. Finally, other complications must be met as they arise; there is nothing to be prescribed absolutely—such cases must be dealt with as experience dictates.

PHTHISIS, OR CONSUMPTION.

By *Phthisis* is meant the bodily wasting which accompanies certain specific lung changes consisting in the formation of a new material in the lung substance—*i.e.*, *consolidation*, followed by *softening* and *destruction* of this, and the lung tissue mixed up with it, ending in the formation of cavities. This new growth is mainly that called *tubercle*. Thus the malady may be divided into three stages—(1) that of *new growth*; (2) that of *softening*; (3) that of *excavation* or *cavities*.

The causation of tubercle is complex. In very many cases there is inherited taint, which may display itself in various ways, according to age, exposure, and the like, for the inheritance hardly takes the form of actual disease, but rather that of a weak constitution. Children so tainted, if exposed to the influence of improper or insufficient food, and even if there be no such inheritance if these influences are persistent, are liable to become consumptive. Foul air, damp, and bad diet are undoubtedly very powerful predisposing causes of consumption, but there may be others acting, even more directly. In the South of Europe the idea is ineffaceably rooted that consumption is directly contagious or infectious, and recent experiments tend to show that such, in a certain sense, is the case—viz., that the introduction of cheesy matter beneath the skin of a healthy animal; or even keeping up constant irritation by a seton, may suffice to set up acute general tuberculosis, in which of course the lung suffers like other parts of the body. The most important influences apart from direct contagion (which is doubtful) seem to be bad or deficient food, especially as regards fatty matters, or (which is much the same thing) imperfect assimilation of the food taken; and humidity. Moist and low situations are always unfavourable to those predisposed to consumption by delicacy of constitution or otherwise. Consumption too may arise in and terminate other diseases—as diabetes and syphilis. Mental depression has a very powerful influence in developing phthisis, whilst certain employments already alluded to in connexion with pneu-

monia—viz., those of grinders, stonecutters, miners, and the like—also lead to phthisis. It is matter of common observation that a bad cold is often the first sign of consumption. On the theory that the malady is due to one kind of growth only (viz., tubercle), this is hardly intelligible; but supposing that pneumonia may end thus, particularly the catarrhal kind, such a sequence becomes quite intelligible. Consumption is rare in children and in the aged. In the very young, the head and the bowels tend to become tubercular as well as the lungs, and are in this way more directly fatal to them; whilst those having any tendency to phthisis do not very often reach old age. From puberty to the age of thirty seems the period of life most prone to the development of phthisis.

The essential history of pulmonary consumption therefore consists in the formation of a new material in the lung substance, and in its subsequent softening and evacuation; but as to the nature of this material views have recently greatly altered. When pulmonary phthisis was first carefully studied, the name *tubercle* was given to the new material, and as it was found in two conditions—viz., either as small grey granules about the size of millet-seeds, and aggregated in groups; or as a yellow cheesy-like material in larger masses, it was inferred that the latter invariably originated from the former, and hence it was called by the same name. Recently, however, it has been shown that the cheesy material is often the remains of a catarrhal pneumonia, and so the name of tubercle came to be restricted to the grey granulation only, and as this is the initial lesion in a certain number of cases, phthisis came to be spoken of as *tubercular* and *pneumonic*. Such a division is not, however, exact: in most instances the two processes are combined. According to one set of views the tubercles set up inflammation; according to the other, the cheesy pneumonic products infect the system, including the lung. The best examples of tubercles are to be obtained in acute tuberculosis, where other organs besides the lungs are affected. In the lung they are found as small grey translucent granulations, isolated, or in groups forming nodules, but are perhaps most typically developed in the meninges and serous membranes. When cut across they present a raised section of roundish or angular shape, firm and elastic, and are in the early stage firmly adherent to the surrounding lung tissues. On microscopic examination they are found to be made up of small cells of the lymphoid

type, generally supported by a stroma similar to that found in lymphatic glands—*i.e.*, these new growths are constructed on the adenoid type. These small-celled growths are found in various situations in the walls of the alveoli and smaller bronchi, and in the alveoli themselves, though in this situation they are more probably of catarrhal origin and have little or no connecting stroma. Later these grey granules lose their transparency, becoming yellowish in the centre, and gradually more and more opaque. At the same time they become softer and more friable, as do the larger masses of small cell-growth, sometimes called *infiltrated tubercle*, the whole undergoing fatty degeneration. The small yellow nodules constituted by the former are what are called *yellow* or *crude tubercle*, but they have by no means invariably a tubercular origin; undoubtedly they and the so-called infiltrated tubercle are sometimes products of pneumonia, but the line of demarcation is not well defined. Even when the growths are examined by the microscope the truly tubercular by insensible gradations pass into the true inflammatory product, and exact distinction becomes impossible even if desirable.

These cheesy masses, pneumonic or tubercular, undergo various changes. They may undergo speedy liquefaction, especially if the blood supply is cut off by the pressure of the new growth on the vessels, and if the walls of the alveoli are extensively implicated; thus the new material and the lung tissue perish together. This softening begins in the centre of the cheesy mass, and gradually spreads outwards, until at last a bronchus is reached, and the puriform softened material is discharged by it, leaving behind a cavity. But when the mutual pressure of the cells of the new growth is not great enough to produce complete strangulation of the vessels supplying the walls of the alveoli, softening and breaking down may be avoided, the cheesy mass shrinks and becomes more and more cretaceous, until at last only a small calcareous nodule is left behind. This becomes encapsuled in connective tissue, and so may remain harmless for many years. In still more favourable cases the whole may be absorbed, leaving no chalky nodule behind. As, however, the alveoli in these cases cannot be repaired, there is a loss of lung substance, to make up for which we see partial sinking-in of the chest walls and dilatation of the smaller bronchi, sometimes in the saccular form, so as to resemble cities formed by breaking-down of cheesy material.

By a continuance of the ulcerative process one cavity when formed opens into another, and so sometimes the whole of one lobe or even the whole of one lung may come to constitute but one huge cavern. Softening is not, however, the only process which can go on. Some of the new growth may become fibrillated, and so hardening of the lung tissues may go on in one part, whilst softening is advancing in another. It is of course the branches of the pulmonary artery which are mainly compressed by the new growth, and they may sometimes remain after obliteration in the form of ligamentous bands stretching from one point to another. If not early obliterated they may form aneurisms projecting into the ulcerated cavities, and become dangerous as sources of hæmorrhage. To take their place branches of the bronchial artery dilate, so that more arterial blood is carried to the diseased than to the healthy lung, the venous blood finding its way back in various ways—one being by means of the vessels of the almost invariable pleuritic adhesions to the intercostals. Owing to this obliteration of branches of the pulmonary, the flow of blood from the right side is obstructed, and this gives rise to various minor symptoms, as clubbing of the finger-tips, blue nails, and so on, especially as the heart, though at first somewhat enlarged, soon shrinks in size and strength. Roughly speaking the progress of the disease is regulated by the relative preponderance of the softening and breaking down, and the hardening or fibrillation of the new growth. The more of the fibrous material there is formed, the slower is the advance of the malady. For a very chronic form of the disease possessing this among other peculiarities the name of *fibroid* phthisis has been invented.

The stages of phthisis from a pathological standpoint are, as already seen, sufficiently well marked—so too are the physical signs arising therefrom; but this is not so with the general symptoms of disease. In considering these, certain general principles must be borne in mind—viz., that the new growth in phthisis almost invariably begins in one or other apex and extends downwards; that one lung almost invariably goes faster than the other, though later the active lung may become quiescent, the other taking on more rapid tissue destruction.

Two of the earliest signs of consumption are *fever* and *emaciation*, the one standing to the other in a certain measure as cause and effect. Pyrexia, as already

seen, is a valuable indication of the implication of the alveoli in catarrhal pneumonia, and its persistence shows a persistence of the formation of a new growth, whether by the tubercular or catarrhal process. But this high temperature must be kept up at the expense of something, and as the nutrition is usually markedly impaired, bodily waste follows. The fever, which is described as hectic, is peculiar, inasmuch as there are in it marked remissions and exacerbations to the extent of as much as $1\frac{1}{2}^{\circ}$ or 2°. In the morning it may have sunk nearly to normal, in the evening it may rise to 102° or more; but the worst cases are those in which with this oscillation there is at all times a persistent high temperature, never falling below 100°. This fever is accompanied by copious night sweats, but the temperature and sweats have no mutual relation. With high temperature we have quickened pulse, it going up to 120 or 140; but, on the other hand, especially during the remission, it may fall to 60. The emaciation of phthisis begins with the subcutaneous fat, the fat-cells wasting by absorption of fat, leaving behind a crystalline mass along with some serum. But later the whole system suffers; muscles and even bones waste, partly from the high temperature, partly from deficient nutrition, especially the imperfect digestion of fat. Still, in some cases there is but little waste, and this is probably due to the digestion continuing good, and the repair being equal to the waste. As far as the subcutaneous fat is concerned, that on the chest seems to go first, that on the face last.

From the peculiar character of the disease we can easily understand that the breathing should be affected from an early period. It is quickened because less aërating surface is available in the lung, from the obstruction of alveoli and capillaries. Besides, the febrile condition requires a quickened rate of respiration to keep up the necessary supply of oxygen and the removal of carbonic acid. Still, dyspnœa is not a marked feature of phthisis, unless after exertion, when both pulse and breathing are quickened to a marked extent, but, unlike pneumonia, the *pulse ratio* continues nearly as in health. Pleurisy may impede respiration by causing pain. Pain is indeed present in most cases, but varies in character and origin. It may be due to bronchitis, to pleurisy, or to what is called pleurodynia. Of these pleurisy is the most important, but it is rare for the chest pain to be very severe. Its most common site is under the left breast, and is then

probably neuralgic; in other situations most frequently pleuritic.

Cough is an almost invariable sign of phthisis. It is also in most cases attended by expectoration, and it is very important as a means of diagnosis to be able to make out the relation of this to the other general symptoms, especially the emaciation. The exact cause of the cough is not quite clear, probably it arises from the catarrh of the smaller bronchi, and is an effort at getting rid of their secretion; but sometimes when very violent it is due to some unusual form of irritation in the lungs and air-passages inducing reflex action. In other cases it is due to the laryngeal and pharyngeal mischief, which sometimes makes its appearance early in the disease. Owing to such local changes too, the cough is sometimes hoarse and toneless. One troublesome feature connected with this cough is its tendency to end in vomiting, owing to the pressure of the stomach against the diaphragm, especially if the fit comes on shortly after a meal.

The sputum of phthisis varies greatly in its different stages. At first it is usually frothy and watery or slightly mucilaginous. Gradually it becomes more glairy and more mucous, but less frothy, the cell-elements in it increasing in number. By-and-by purulent streaks appear, and if these be examined we may be able to find in them elastic fibres of lung tissue, a sure sign that the proper lung substance has been invaded and that the alveoli are breaking down. When cavities have fairly formed it is common to find the sputa in round globular or nummular masses, which remain apart, being separated by transparent mucus. This is more noticeable if they are thrown into water, in which these tend to sink. These masses consist of cell-forms in various stages of disintegration, mixed with remains of lung tissue and coated with the secretion of bronchial catarrh. The sputum of the later stages consists of dark green purulent matter which coheres in a mass after expectoration, though occasionally on the opening of a fresh cavity a large quantity of diffluent pus may be expectorated, and the same often happens in the morning. Phthisical sputa are from time to time mixed with blood, and in a majority of cases this blood is in considerable quantity. Sometimes this bleeding (hæmoptysis) is the first indication of the disease, and a division of the malady has been made by some to include *phthisis ab hæmoptœ;* but though hæmoptysis may be the first sign of phthisis, it is by no

means certain that it is ever its cause, for it is usually possible on careful inquiry to make out failing health before the onset of the hæmorrhage. When bleeding is the first sign which alarms the patient, it is often copious, and it may never recur; if it does, the subsequent bleedings are usually less abundant than the first. Hæmoptysis is more common in the second and third stages than in the first, and it is more frequent in those somewhat advanced in life than in the young. Though profuse hæmoptysis may come first, it is much more common for the blood to appear in streaks or tinges in the bronchial sputum. This last can hardly be said to be a special symptom. The quantity of blood brought up varies greatly, from a streak or a mouthful or two, to two or three pints, the blood being usually bright red and florid. In the early stage the bleeding is probably due to weakening of the vascular walls by tubercular growth in them; but in the later, especially the third stage, it is more frequently due to bursting of minute aneurisms and unplugged and unsupported branches of the pulmonary artery, that vessel sometimes dilating when deprived of its supports on the excavated side.

Some of the most troublesome features of phthisis are due to implication of the digestive organs. As already pointed out, emaciation is partly due to this cause. The mouth is often affected, the tongue being raw, red, and sometimes fissured. In the later stages of the malady stomatitis is common, and even in the earlier the edges of the gums look raw and irritated. Salivation occurs, though rarely, and there is some reason to believe that the saliva is altered. Too often there is complete failure of appetite, due to changes in the mucous membrane of the stomach, such as occur with any degree of pyrexia, but often digestion in the stomach is easily and perfectly accomplished, the failure lying farther on, in the small intestine, where fats are chiefly transformed. Undoubtedly this is one of the most important features in many cases of pulmonary consumption, but can hardly be admitted to be its cause. The bowels are often the seat of tubercular deposit, giving rise to ulceration, especially of Peyer's patches, and perhaps also to fistula. As a consequence we find tubercular ulcerations and diarrhœa sometimes uncontrollable, the matters ejected being frothy and putrid-smelling. If the ulcers eat deep enough, peritonitis may be set up, but this is rare. Constipation sometimes occurs instead of diarrhœa, and in a greater number of instances the bowels are irregular. The tubercular condition

of the mesenteric glands is another circumstance sadly interfering with nutrition. One of the most characteristic features of phthisis is the hopeful temper, the patient persisting in making schemes for long years to come when he is already in the grasp of death. The absence of any marked degree of pain helps in this, but will not account for it.

But the most important signs of phthisis are derived from the physical marks of the disease. The very appearance of the chest is often characteristic. Often it shows deformity, the consequence of impaired development. But the most characteristic chest of phthisis is the long and narrow chest, with sloping shoulders and long neck, the scapulæ sticking out behind. For the rest, the characters elicited will depend much upon the stage. In patients in the first stage, before softening has begun, we find dulness on percussion over an area depending on the extent of the consolidation. In this stage the fossæ above and below the clavicles may be slightly depressed, partly from loss of subcutaneous fat, which has already set in; partly from shrinking due to obstruction of certain of the air-passages and collapse of corresponding alveoli; partly to pleuritic adhesions and contractions. From the same cause—*i.e.*, condensation, the thrill of the voice is propagated more readily to the hand, whilst the respiratory movements are less marked. Percussion too gives a dull, high pitched note over the consolidated spot. The percussion should be light, and is best made just over the apex of the lung, and the tone is much less altered on the unsound than on the sound side by inspiration and expiration. The results of auscultation at this stage are less satisfactory, owing to the very varying conditions. In the consolidated spot the respiratory murmur is deficient, owing to obstruction of alveoli; but, on the other hand, the bronchial sounds are better conducted and so better heard; for certain reasons too the motion of the chest walls is jerking in character. It must always be remembered that these alterations are most significant when confined to a limited area. As soon as bronchial catarrh begins we have moist, bubbling râles of various kinds. In the second stage we have most of the above signs intensified, there is greater shrinking of the chest wall, and as in a good many cases the new growth continues to extend we may have an increased area of dulness, but this is not absolutely necessary. The note elicited by percussion is usually in this stage more wooden than before, whilst the breathing

is harsher and more blowing. But none of these indicate softening; what does so is a thin metallic bubbling, tending as cavities form and enlarge to become more resonant or cavernous.

In the third stage this cavernous character is much more distinct, the breathing, if the cavity be dry and near the surface, is loud, blowing, or amphoric (like blowing into a cask or over the mouth of a bottle). If the cavity contains fluid, then gurgling sounds are produced by the bubbling of the air passing through it and the resonance of the cavity. The cough too is amphoric, and a kind of metallic bubbling may accompany the breath or voice. The voice, even in a whisper, is in this condition conducted more readily to the ear at the chest than the disengaged one, a condition called pectoriloquy. If the cavity be large and close to the chest wall, percussion may give a tympanitic note; but if any amount of consolidated lung lie between, then a wooden or tubular one is elicited. One of the most significant signs of this stage is due to a cavity containing fluid coming close to the heart or great vessels. In such cavity a splash is sometimes heard coincident with the heart's contraction. The position of the heart, however, it must be remembered, is often changed, especially in chronic cases; it is both smaller from wasting, and drawn out of its proper place by contraction of the lung adherent to the pericardium. Again, if the bronchus leading to a portion of lung be completely obstructed, no sound whatever may be heard over a considerable space.

Pleurisy, bronchitis, and pneumonia are so common in phthisis that, except in a strictly technical light, they can hardly be regarded as complications. Of these the most serious are pneumonia and pleurisy with effusion, which not unfrequently cut off the patient; or the bursting of a cavity into the pleural cavity not yet obliterated, may produce pneumo-thorax.

The course of phthisis is by no means definite. The greater number of patients sooner or later die, but some live for many years, and die from something quite distinct from the original malady. Death may result from pure asthenia: the patient sinks to a final rest, worn-out by suffering, want of sleep, and failing nutrition. In other cases intercurrent mischief may close the career, such are an uncontrollable diarrhœa, or obstruction of the bowel as the result of cicatrization, peritonitis, pleurisy, laryngeal and pharyngeal mischief, or the like. More sudden still

is the termination by profuse hæmoptysis or syncope, however induced. Fortunately this mode of termination, *i.e.*, by death, is not invariable, and the patient may, by the gradual absorption of the new-formed material, the encapsulation of caseous masses, and the cicatrization of cavities, be restored to a degree of health. Most frequently such changes are but local and temporary, the disease continuing to make head, though slowly. The most certain sign of improvement is the permanent fall of the temperature to the normal range.

Treatment.—The treatment of consumption, once hopeless, is now much more satisfactory. If we cannot always cure, we can do much to lengthen days and otherwise assuage the evils of a very prevalent disease. In the first place the children of delicate parents should be brought up with unusual care as to their hygienic surroundings. Especially is it important to these that a good wet-nurse should be procured, or, if that is not practicable, that the food should be as carefully selected as possible. Every tendency to ailments in childhood, especially those of the scrofulous kind, should be promptly checked. Plenty of open-air exercise should be permitted; the hours devoted to education should be short. Cod-liver oil should be given on any sign of falling away, and sea air procured if possible once a year, whilst those who habitually live by the sea may profitably exchange it for mountain air. In delicate children and adults alike the winter spent in a warm, equable atmosphere is a winter spent profitably. Chills in all shapes, especially complicated with damp, are to be avoided; hence flannel next the skin is a necessity. Irritating vapours or dust, violent exertion, and all similar causes of bronchial catarrh, are to be avoided, and every catarrh dealt with as of the first moment.

But too often every care does not suffice to keep off the malady, and we have either to treat a patient whom we have thus watched struggling against the onset of the disease, or one who is a stranger to us. In whatever stage we find the patient, it is nowadays the constant practice to give cod-liver oil. Unfortunately its use is not so well understood. It is not the giving of the cod-liver oil, it is its digestion and absorption which is desirable. If we give too much we defeat our own ends. In the first place, the oil should be pure and sweet. Of the former, colour is a good test; and of the latter, the taste. Good cod-liver oil should be as nearly as possible

colourless and transparent. *Every tinge of colour is a sign of impurity.* Its taste should be that of pure olive oil, with a slight and not unpleasant fishy twang. Such an oil only should be prescribed, and such can easily be got at as low a price as five shillings per gallon, if bought in quantity, but as it does not keep over well, it is better to buy only a small amount at one time, though more is paid for it. Now this oil should be begun in such quantity—never exceeding a teaspoonful—that it will be digested, and will not repeat. Even a few drops may be given at first. The great thing is to begin, and as it is employed the power of taking it will increase. The times for giving it too should be carefully attended to; thus it will often be well taken half an hour after a meal, when it would return if taken before. Often it is best taken at night. Good oil is best taken by itself, and a little draught containing a few drops of aromatic spirit of ammonia and spirit of chloroform in water may be given after it. In most cases the quantity of oil may be gradually raised to an ounce three times a day; beyond that, it is not advisable to go. Sometimes when it cannot be taken internally the oil is administered by inunction. This is possible in a child, but the smell to a delicate adult is horribly nauseous, and does more harm than good. If cod-oil cannot be taken, it may be from whim on the part of the patient, good salad-oil may be tried. Here too the rule is absolute—to use only the best. Cream by itself is generally too heavy, but with brandy or curaçoa and soda-water, it can often be taken—this of course among the higher classes, where champagne may also be used as an admixture. Sometimes solid fat emulsified with ether and liquor potassæ, with or without pancreatic extract, will do good. Milk fresh and hot from the cow is an excellent food as well as medicine for phthisical subjects. Abroad, an extract of malt is sometimes used, it is said with great advantage, but it has failed to take root in this country. The food should always be as good and plain as possible—plain, because then the more easily digested.

Fever, *i.e.*, pyrexia, is always a troublesome symptom in phthisis, sometimes it is almost intolerable. For it there is nothing better than the warm bath or tepid sponge; these, though called warm and tepid, are decidedly below the temperature of the surface, and so cool it, but not so rapidly as to cause a chill. For the same purpose digitalis and quinine are employed with advantage in most cases, but the

effects otherwise may not be agreeable. For the local pains counter-irritation is chiefly employed. The best means are those which can be continued longest with least discomfort. No permanent open sore should be tolerated. Flying blisters are good, so are occasional mustard-poultices, or better, mustard leaves (Rigollot's). One of the best applications is a mixture of croton-oil and turpentine, say equal parts, or where the skin is delicate, with an excess greater or less of turpentine. In ladies, where it is desirable to act on the neck without marking the skin, a solution of iodine in iodide of potassium with spirit of chloroform will be found good.

To allay irritability of stomach, liquor potassæ with calumba or cascarilla is often of great service, whilst in other cases nitro-muriatic acid with strychnine is of more benefit. Iron in some form should be given, but judgment should be used as to the form. Reduced iron, mistura ferri co., and syrupus ferri iodidi are the best as a rule. For the bronchial catarrh small doses of vinum ipecacuanhæ, with or without extract. opii liquid., is good, provided there is no sweating, and opium under like conditions and where the expectoration is slight, may be given in small doses to allay cough; but when there is very much expectoration its exhibition is inadvisable. Inhalations are now often used for the expectoration. The best are very weak inhalations of iodine, creasote, and turpentine, whilst if there be great dyspnœa a little ether will be of service. Hæmoptysis is a serious complication, and if possible should be promptly stopped (see HÆMOPTYSIS). Night-sweats are best controlled by cool sponging with aromatic vinegar and water, and a few doses (♏ 15–30) of dilute sulphuric acid. Nausea and vomiting being partly due to mechanical causes, will be relieved by arrest of cough, but ice, effervescing drinks, bismuth, and morphia may be used. Diarrhœa is too often intractable: it is best treated by bismuth, by enemata of starch and opium, or by pill of acetate of lead and morphia in still smaller quantity. Tepid hip baths often give great relief.

It would be impossible in this space to discuss fully the benefits of change of climate, and it would be useless, as each case must be decided on its own merits. Some want stimulant, some sedative effect. This only we would vehemently urge—if change of climate is to be tried, let it be done early: it is a shame to send away a man, still more a woman, to perish among strangers, without a comfort and without a friend. Besides, it must be remembered

that the climate which will suit at one time of year will not suit at another, and a confirmed *poitrinaire* becomes a wanderer on the face of the earth.

GANGRENE OF THE LUNG.

Pulmonary gangrene has already been alluded to as one of the occasional sequels of the pneumonic process: in it we have not only death of tissue, but also decomposition of the dead part. This change is greatly favoured by the presence of already decomposing tissue, so that an embolus from a part where a putrefactive change is going on is very apt to set up the same kind of change in the lung itself. A debilitated condition of the body too inclines inflammatory action to pass on to gangrene, as happens in lunatics. Gangrene of the lungs may be either *circumscribed* or *diffuse*, the former being the more common of the two, occurring in spots of the size of a marble and surrounded by œdematous pulmonary tissue. The slough is abruptly separated from the healthy tissue and tends to pass into a dark green mass of putrilage which is horribly offensive. In the diffuse form there is no abrupt line of demarcation, but a whole lobe it may be is black, foul, and putrid, consisting of a felt-like substance infiltrated with stinking fluid. In either form the pleura and bronchi may be partly involved, and intense inflammation set up in them.

There are no very well-defined signs of the occurrence of gangrene until the putrilage begins to be ejected as a fœtid sputum, but there may be signs of unusual prostration, and of blood poisoning previous to this, and the breath may be foul for a good many days before the fœtid sputa are seen. These sputa are black or dirty-brown, and sometimes contain solid portions of rotten lung substance, though for the most part liquid. In circumscribed gangrene we may have an early prostration of strength, the patient rapidly passing into the typhoid state; or there may be but little constitutional disturbance for a time. In diffuse gangrene there is abrupt, occasionally intense prostration, with small, quick, or irregular pulse, and in a short time the black, stinking sputum makes its appearance; but frequently in the later stages this ceases entirely, the patient being too weak to cough it up. In either case death, as a rule, is speedy. Recovery from the circumscribed form may occur by gradual expulsion

of the gangrenous materials and the assumption of healthy cicatrization by the wall of the cavity, but it is rare.

Treatment is of little service save in those cases where the constitutional symptoms are at first slight. Then we may hope to get rid of the offensive sloughs before the irritative fever, which commonly proves fatal, is set up. To this end the prevention of putrefaction and septicæmia are important, and whilst bark and ammonia, liq. ferri perchlorid., strong broth, and wine are plentifully administered, we must try the effects of inhalations of creasote, carbolic acid, and oil of turpentine. These are best made use of by evaporation from hot water, but the air can readily be impregnated with carbolic acid vapour from any vessel placed over a heated iron or lamp.

HÆMOPTYSIS.

Hæmoptysis is but a symptom, but a symptom which can kill, and so rises to the dignity of a disease. Not all the blood that comes from the mouth comes from the lungs, and hence spitting of blood may have a very varied significance. It may come from the teeth, the pharynx, and posterior nares, from about the epiglottis or the stomach. True hæmoptysis comes from the lung only; but even then it may be the result of heart disease or of aneurism of the aorta. The blood which is expectorated in bronchitis seems to be due to overfilling of the vessels—*i.e.*, acute hyperæmia; and the same is true of pneumonia. That expectorated in early phthisis is generally due to rupture of fragile vessels whose walls have become the seat of tubercular infiltrations. Later in this disease it frequently results from the bursting of small aneurisms of the pulmonary artery. *Bleeding* is a very common symptom of cancer of the lung and mediastinum, but after phthisis the most frequent cause of hæmoptysis is disease of the heart and great vessels. Often the first sign of aortic or mitral disease may be the expectoration of a quantity of blood on exertion. The existence of the heart disease will be a guide to the cause of the bleeding. Such cases are seldom complicated by phthisis. Aneurism of the aorta not unfrequently bursts by the trachea or bronchi, and may do so again and again without causing death. Such a circumstance should never be forgotten, as it may give a clue to the source of hæmorrhage, otherwise not easily

detected. In almost every case violent exertion greatly aggravates the risk of hæmoptysis in those who are the subjects of either lung or heart mischief, and should therefore be avoided.

The blood brought up from the lung is generally bright florid red and frothy; more rarely it is dark, especially if coming direct from the pulmonary artery and in any quantity. It may at first be gulped up or apparently vomited, but it almost always ends in being coughed up or expectorated in small quantity. This gives a clue to diagnosis. The view that phthisis frequently originates in hæmoptysis is not generally received in this country, it being usually held that the tubercular deposit causes the hæmorrhage, and not *vice versâ*.

Treatment.—The great thing is absolute rest and quiet, with light clothing and free circulation of air. Ice or cold compresses should be applied to the chest, and ice should always be given to the patient to suck. All food should be cold, conversation forbidden, and even coughing prohibited. It is wonderful how much coughing is under the control of the will. Some give tartar emetic or ipecacuanha in nauseating doses, and there is good authority for stating that vomiting does not increase the bleeding; some even say it cures it. Of the medicines given, some have a great reputation. One of the best is gallic acid made into a paste with water and given in large doses (gr. 30, or more) along with a few drops of dilute sulphuric acid. Acetate of lead and opium are also justly valued. Common salt in drachm doses is often of great service, whilst oil of turpentine sometimes succeeds, sometimes fails. The latest remedy introduced, and with undoubted success, is the ext. ergotæ liquidum, in doses of ℥ss frequently repeated. In most cases treatment for the time being is successful, but not unfrequently the consequent weakness favours the disease, giving rise to the hæmorrhage.

MALIGNANT DISEASE OF THE LUNG.

This as a primary affection is exceedingly rare; in any shape it is not common, and when it does occur is usually either a secondary affection or spreads to the lung from one of the neighbouring organs, especially the mediastinal glands, or it may be by direct communication with a cancerous breast in the female. The signs of it are very vague; as a primary affection it could not easily be diagnosed, though it might be guessed at, if with dulness of one part

of the lung we find a *swelling* of an adjacent bone, such as the clavicle, whilst progressive emaciation goes on without hectic or cough, and with signs of the cancerous dyscrasia. Of course if this follows primary cancer elsewhere, especially in the breast, our suspicions would receive strength, but could only be confirmed either by death or the appearance of the malignant growth outside the chest.

Cancer of the lung is most frequently of the medullary kind, and appears in the form of rounded masses, sometimes isolated, but also sometimes infiltrated—most frequently the former. These masses do not often tend to break down, but rather extend to the pleura and chest-wall. *Treatment*, save for symptoms, especially pain, is out of the question; we can only try to prolong life. But too often the patient dies without any definite diagnosis having been made.

COLLAPSE OF THE LUNG.

Collapse of the lung may be congenital or acquired. In the former (atelectasis) the lung, or some part of it, remains in the fœtal condition; in the latter, the alveoli of a certain district are obliterated, either after obliteration of the bronchus leading to them, or by compression. The latter is especially common in young children, the subjects of catarrh, while as yet their bronchi are small and easily obstructed; or it may occur in adults as the result of great prostration when the patient is unable to clear the bronchi of their secretion. This sometimes happens in typhoid. Compression is most frequently the result of the presence of fluid in the pleura or pericardium, of aneurism, and ascites. The collapsed lung is dark blue in colour, airless, and firm in texture; and though at first capable of inflation, soon ceases to be so, the walls of the alveoli becoming glued together. This, as we have seen, is a favourite starting point for catarrhal pneumonia. In children the unaffected lung or part of the lung tends to become œdematous from the collateral flux of blood to it, and this really constitutes the danger of the condition.

Treatment.—In newly-born children the great point is to procure free respiration and to empty the air-tubes of the mucus which may be drawn into them from the mouth. Hence they should be encouraged to cry, and the mucus removed, if necessary, by an emetic; afterwards they must be cared for more than usual, and everything done to strengthen them. In adults the treatment depends on the cause and the course of the symptoms.

DISEASES OF THE PLEURA.

PLEURISY.

Pleuritis or pleurisy is the name given to inflammation of the lining membrane of the chest. It may be *general* or *partial*, *acute* or *chronic*. Most frequently only one side is affected, but sometimes, especially in pleurisies of what might be called constitutional origin, such as occur in Bright's disease, we find both sides attacked—the pleurisy is *double*.

Hence, as regards origin, we may be said to have pleurisy from such causes as give rise to general inflammation of serous membranes, as in puerperal and scarlet fevers, and chronic Bright's disease. But most frequently it may be traced to a more distinct local causation, as injury by the ribs, effusion into its cavity of putrid fluids from the opening of abscesses, &c., extension of inflammation from neighbouring organs, as in pneumonia, and the irritation favoured by new growths on its surface, as cancer and tubercle; whilst we have also a form of the disorder which arises from cold or some similar influence. According to the mode of causation and the health of the individual, the products of inflammation vary greatly. In some cases the surface is merely as it were covered with a soft material composed of proliferating cells, tending to unite the opposed surfaces, for pleurisy spreads by contiguity, not by continuity. In others there is a plentiful effusion of blood-serum with or without plastic material; whilst, finally, the effusion may from the beginning be purulent.

In the early stage of the simplest form of pleurisy we find the pleura more vascular than usual and less shining; at intervals we see rose-red points. It is thickened and its epithelium is cast off. The surface is roughened by granulations, but there is no exudation, and, it may be, little or no pain. Here the changes are solely in the tissues of the pleura, and they tend to union of its two sides. This may or may not give rise to important symptoms.

But in another form we find the symptoms much more marked. The patient is suddenly seized with severe pain or stitch in the side, preventing him almost from breathing. Coughing is almost intolerable, even ordinary breathing is quick and shallow, and as far as possible effected by

the sound side. The patient *will not* breathe for the pain—not, as in pneumonia, because he *cannot*. He bends towards the affected side, and any sharp pressure on that side greatly aggravates the pain. Often there is a sense of rubbing inside the chest, at some one point. The pulse is quick and the temperature high; but in this form there is little prostration, and the patient may hardly keep his bed. It is probably this form of pleurisy which gives the pain in croupous pneumonia. In the pleura we find the changes above-mentioned, but also an additional coating of young cells, partly derived from the blood, partly from the pleura itself, and so commonly called an exudation.

The disease may cease here or go on another stage, which in some cases is the first. It consists in the effusion of serum more or less copiously, in addition to the changes already described. Sometimes we find flakes of what is called lymph floating in the liquid as well as adherent to the walls of the chest and lung. In this form of the disease the general symptoms are more marked. There may be an initiatory chill or even rigor, and if so this is followed by all the marks of fever. The pain in the side is severe from the first, but afterwards the pain diminishes as the difficulty of breathing increases. The patient cannot breathe now for the pressure of the fluid effused. Cough is troublesome, but not so painful as in the earlier stage and form. This form too seems to attain a crisis, and then to gradually improve, or at all events the acute symptoms abate, for the malady is apt to pass into the chronic stage. The longer the effusion remains the less is it likely to be absorbed, as the firmer and thicker become the membranes on the pleura. The fluid too varies greatly in character; early it may be clear straw-coloured serum, but it soon begins to contain cell-forms which may increase until it is more or less purulent in appearance and character. The malady, when it passes into the chronic stage, is exceedingly tedious; one day the exudation will diminish and the patient improve, the next all the signs are aggravated and he is worse than ever.

Sometimes in this form of pleurisy—that is to say where the serous effusion is the predominant feature, and especially in children—the effusion comes on gradually, there is little elevation of temperature and little pain, the first symptom often being shortness of breath, the consequence of the effusion. These patients are commonly, when seen, far advanced in the disease, and

complain of weakness and shortness of breath, without being aware of any specific cause. Such patients are apt to suffer from hectic, but these exhibit no very high temperature, and yet they gradually waste. The malady commonly ends, before or after operation, in the next and worst form of pleurisy—viz., that in which the effusion is distinctly what we call *purulent empyema*. This condition may be the very earliest form of pleurisy, or it may only occur late in the history of the malady and after repeated tappings. This is the form which occurs in certain forms of blood-poisoning, and may come on most insidiously as well as in the way mentioned.

In the early stage of pleurisy, particularly of the dry kind, the patient lies on the unaffected side, any pressure on the inflamed side being generally, but not always, too painful to permit of the patient resting on it. Later, when the effusion is extensive and pressure on the lung severe, it may be impossible to breathe with that lung at all, and so the sufferer has to lie on that side to free the movements of the other. Often the position is diagonal with the head slightly raised.

The physical signs of pleurisy are usually sufficiently well-marked, but sometimes it is not easy to differentiate between pleuritic effusion and other causes of dulness over the chest. In the early stages the only thing to be seen is the care the patient takes in breathing on the affected side, whereby the ordinary respiratory movements are diminished and the sounds weakened. Later, while the movement continues as before, the hand applied to the chest wall may detect a friction thrill in a certain number of cases, this being imperceptible to the patient. On auscultation this friction resolves itself into a sound of rubbing or scraping. It is heard wherever the two surfaces of the roughened pleura come in contact, and is audible both on inspiration and expiration. This sound has been likened to the creaking of new leather. Some intra-pulmonary sounds are not unlike it, but these can be removed by coughing, which the friction sound cannot.

But all these last as a rule only a short time; liquid effusion follows sometimes rapidly, though it may not occur at all, and when that is the case the previous group of signs will be alone manifested. With effusion comes separation of the two sides of the pleura; consequently the friction sound is lost, though it may be restored on deep inspiration. The feeling of friction also goes where there is effusion, and so too does

the vocal thrill ordinarily felt in male chests. Inspiration no longer shows the restrained respiratory movements; but, if the effusion is at all copious, we see instead diminished expansion movement, especially at the lower part of the chest; there, too, the intercostal spaces bulge, or at all events are on a level with the ribs. Percussion gives over this area a high-pitched sound which we commonly call dulness; but higher up, where there is no effusion, we have a tubular or tympanitic note. The exact boundary line between these two depends of course on the level of the fluid, and may be made to change by altering the position of the patient. The dulness is usually first detected low down in the back, and thence gradually extends upwards and forwards, but rarely reaches such a high level in front as behind, and the change from dulness to resonance is generally most marked anteriorly. On auscultation the effusion may be copious enough to drown all respiratory or vocal sounds; but if not so plentiful as to do this the respiratory sounds are weakened, whilst the vocal resonance may assume a peculiar vibratory character, commonly likened to the bleating of a goat or to Punch's call. It is termed *ægophony;* but it is by no means invariably present, and very often is missed, as profuse effusion drowns it as well as all voice sound. Where the lung is not compressed, we have loud bronchial respiration, and so we have on the opposite side, except there be in catarrh a complication, when its sounds may replace the ordinary breathing sounds.

With profuse pleuritic effusion we have displacement of organs. If on the left side, the heart may be pushed over to the right of the sternum: if on the right, the liver will be displaced downwards. Of course effusion into the right pleura may be copious enough to affect the position of the heart, but this is not quite so common. There is no respiratory movement in the chest-wall, and the side is found to be enlarged on measurement. Dulness on percussion now exists all over that side of the chest, except it may be an imperfect muffled resonance over the root of the lung, for the lung is completely collapsed and compressed against its root, where alone some breathing of a bronchial character may be detected. When there are adhesions, of course these phenomena will be materially modified; so that in one part of the chest we may have distinct marks of effusion, at another of resonant lung.

All kinds and forms of pleurisy may end in recovery, except that perhaps which sometimes gives the *coup de*

grace in some chronic maladies. Of course the most favourable termination is by absorption, more or less rapid, of the effused fluid. Then the two sides of the pleura come to adhere, the collapsed lung gradually distends, the side falls in if this distension is not complete, so as to help to accommodate the diminished capacity of the lung, and the heart is dragged over to one side. If the pleurisy has been left-sided, it is dragged upwards and outwards to the left; if right-sided, upwards and to the right side of the sternum. The intercostal spaces become more marked, the shoulder falls, and the distension of the chest on respiration is imperfect. Absorption is generally a very tedious affair, and may end in permanent mischief to the lung tissue; but it often is complete and leaves the patient perfectly well, at all events able to fulfil every duty of life, even though his pleural cavity is obliterated.

But there is another version of the story; the effusion may become purulent and the patient hectic. The empyema thus formed will burst if it be not opened. If it burst, an œdematous-looking swelling forms about the fifth rib. This soon fluctuates, opens, and a quantity of pus is discharged, but the patient has now a permanent pleural fistula. Such patients seldom get permanently well, though they may improve, and generally die of lung disease. More rarely the empyema opens internally through the lung, and after discharging a quantity of pus, gives rise to pneumo-thorax; but recovery with retraction of the side may even here sometimes take place. More rarely still, the empyema perforates the diaphragm, and sets up peritonitis. A grievous complication in pleurisy is œdema of the lung, from over-filling of the vessels on the sound side. Too much work falls on this lung, and so the blood tends to accumulate in it and in the right heart. Death follows, either from the lung complication or from some other dependent on engorgement of the right heart. Most frequently chronic pleurisy with empyema ends in death by hectic or phthisis established on the local mischief.

Treatment.—In the olden time pleurisy was treated in one way only—by bleeding and mercurialization. Even now, the dry form of pleurisy coming on in a robust individual is often better treated by bloodletting than in any other way. Perhaps the best mode of bleeding is cupping over the most painful part; but some prefer leeches. Cold compresses also are of great service in giving relief, and if the pain is great a good large blister put on for

half an hour and followed by a poultice will often effectually remove it.

Such measures, however, cease to be effectual as soon as there is any considerable amount of effusion. Hence, as soon as the fever has lessened, the best thing is to remove the fluid, which nowadays is easily and safely done by means of the aspirator. It is not advisable to act too soon; but as soon as the fever abates it may be used, whatever the condition of fluid in the chest. In days gone by, diuretics—as squill, juniper, digitalis, and broom—were used to get rid of the fluid, local applications of blisters, iodine, and the like being employed to promote absorption; but the other plan is better. The old pill of digitalis, squill, and blue pill, given along with iodide of potassium, is, however, a valuable remedy where aspiration for any reason is not applicable.

The great thing is to prevent the pleurisy from becoming chronic, and to this end removal of the fluid again and again if necessary is best; but if an empyema form, and the patient show signs of hectic, then it is best to open the cavity of the chest pretty freely, and to put in a drainage-tube, washing out the cavity two or three times a day with carbolic-acid lotion, Condy's fluid, or some other disinfectant.

The diet, too, which in the acute stage should be of the simplest kind, now requires to be of the best; and stimulants in the shape of port wine, stout, and the like freely given. Iron in good large doses becomes essential, and a change of air is equally important.

HYDRO-THORAX.

This name is given to dropsy of the pleura. It seldom occurs by itself, but is often seen in the last stage of general dropsy. It may, however, result from local mischief; most frequently it arises from heart disease or Bright's disease. It is not difficult of detection; we have all the signs of pleuritic effusion, generally on both sides, but no pain or other indication of pleurisy. Dyspnœa is one of its most marked features. Its treatment is removal of the fluid by aspiration if it is deemed worth while to do so, but it is useless to attempt it when the patient is already in the last agony from other causes.

PNEUMO-THORAX.

Hydro-pneumo-thorax is the condition encountered when there is communication between the lung and the pleura, the latter containing both air and fluid. It may arise in various ways. Thus it may result from injury to the chest and the entrance of air into it, but most frequently follows either from the opening of a cavity in the lung into the pleura, or the opening of an empyema through the lung. In no case is it very common, but it is most frequent as a complication of phthisis. As a consequence of its occurrence the lung partially collapses, the pleura fills with air, and the side becomes motionless and dilated—not from fluid, but from air, and so it drums on percussion. At the same time, by shaking the individual the fluid may be heard splashing in the cavity—*succussion*. There is no vocal thrill nor respiratory murmur. Recovery from this condition is rare, and we are hardly in a position to favour its occurrence, save by doing everything to promote the comfort of the patient. Puncture by a fine trocar may for a time give relief, and inhalation of ether often gives comfort for the time being.

DISEASES OF THE URINARY ORGANS.

HYPERÆMIA AND CONGESTION OF THE KIDNEYS.

As is the case with other organs, the kidneys may become the seat of hyperæmia and congestion. Of the former, sometimes called active congestion, the most frequent causes are irritable substances which are eliminated by the kidneys, such as cantharides or turpentine in large doses, sugar in diabetes, and exposure to cold. With regard to mechanical congestion, as in other organs, we may have obstruction caused by heart and lung disease, and in addition the pressure of abdominal tumours—especially the pregnant uterus—and of ascites acting on the abdominal cava or renal veins. Of these two sets of causes, the mechanical congestion is a much more potent cause of urinary mischief than is the arterial hyperæmia.

Hyperæmia may occur in the course of various maladies of an acute kind, just as hyperæmia of the spleen occurs; but as enlargement is the sign of splenic engorgement, so we must take albuminuria as the indication of hyperæmia of the kidney. In hyperæmia of the kidney we seldom have much albumen, blood-corpuscles are rare, and the renal epithelium shed is scanty. Moreover, there is no dropsy, and with the exciting cause the condition disappears. Sometimes we may have the signs of hyperæmia of the kidney from a mere cold, but this is apt to be overlooked except the urine happen to be examined.

In mechanical congestion due to obstruction, the condition of the kidneys and the symptoms vary with the degree and duration of the congestion. The changes resulting from old-standing renal congestion are similar to those elsewhere encountered: the organs become tougher and harder, the secretory substance is altered and diminished, whilst the tubules are thickened and varicose, their epithelium more or less granular. If, on the other hand, the congestion is only temporary, even though albuminuria,

blood, and bloody casts be present while it lasts, the kidney promptly recovers its normal condition, and all symptoms of congestion disappear. The albuminuria of pregnant women is a more serious matter, not from the albuminuria —though that may prove persistent if it has again and again occurred, as it is apt to do in pregnancy—but from the convulsions which are prone to occur and too often to prove fatal. The albuminuria of pregnancy does not occur till late—*i.e.*, the seventh or eighth month, or even later, and it passes away rapidly after delivery. It is most frequently found in women for the first time with child, the parts being then much more resistent than afterwards. In nearly half the cases of albuminuria in pregnant women convulsions occur, and too frequently prove fatal.

The *treatment* to be pursued in hyperæmia from cold consists in warm baths and full doses of Dover's powder (pulv. ipecac. co. gr. x, in some hot drink) or of pulv. antimonialis in 5-grain doses. In congestion of the passive kind, purgatives of the saline kind are more valuable —even those of hydragogue quality, as compound powder of jalap—may be administered with advantage. But the grand rule is—*tolle causam;* remove the obstacle to the circulation, and that as speedily as possible, when the congestion will of itself subside. In both forms a poultice of digitalis leaves over the loins is sometimes beneficial.

ACUTE BRIGHT'S DISEASE—TUBULAR NEPHRITIS.

By Bright's disease we practically mean albuminuria, with or without dropsy, dependent on disease of the secreting substance of the kidney. We encounter it chiefly in two forms—the acute and chronic. Some which are chronic from the first, some which pass from the acute to the chronic condition, and in some the acute has supervened on the chronic form of the malady.

Acute Bright's disease is an inflammatory affection, and is most frequently seen after scarlatina, especially when the patient is in the stage of desquamation. At all times cold and wet have a powerful influence in developing Bright's disease, but more especially under such circumstances. Nevertheless, neither cold nor damp is necessary for the development of acute nephritis in the later stages of scarlatina; it may thus be considered as part and parcel of the epidemic malady.

And this is the more certain, inasmuch as the proportion of patients attacked with acute Bright's disease varies in different epidemics, and it is often most prevalent where the eruption and other symptoms have been slightest, as if the brunt of the mischief had fallen on the kidneys rather than on the skin and mucous membranes. Acute nephritis may also occur as a concomitant of the algide stage of cholera, and is the cause of death in a goodly number of cholera patients who have passed through the stage of collapse, and have reached that of reaction, the urine, however, failing to show itself. It may also follow certain other maladies, as erysipelas, or the use of such substances as cantharides or corrosive sublimate in poisonous doses.

However induced, acute nephritis commonly begins with a slight feeling of chilliness, or shivering, which is very frequently overlooked. There is a feeling of weight rather than pain in the loins, and in some a great tendency to vomit. There is headache, dry skin, and oppression on the chest. There is a good deal of fever, the pulse is quick, full, and hard, and there is great thirst, and complete loss of appetite. There are frequent calls to make water, but the patient fails to pass it in any quantity, and sometimes passes none at all. What is passed is dark-red in colour, sometimes distinctly bloody, most frequently of a dirty-brown smoky tint, something like stout or porter; on standing, it throws down a copious deposit of the same or a redder hue. The urine passed is acid as a rule, but it does not smell like urine; on standing it generally deposits urates and pigment. The specific gravity under such circumstances is rather high, and may be unusually so. If a small quantity of this urine be taken and placed in a test-tube, the application of heat may be sufficient to cause it to become almost solid from the coagulation of albumen; but as there is a slight risk of the whole albumen present not being thus solidified, it is better to add a drop or two of acetic acid before, or a drop or two of weak nitric acid after the boiling. The quantity of albumen passed varies from 80 to 400 grs. in twenty-four hours. The sediment, if examined by the microscope, shows blood-corpuscles in various conditions, no longer, for the most part, biconcave, but swollen and biconvex, or shrunken, and concave with crenated edges; but care must be taken not to confound these swollen corpuscles with free epithelial nuclei, which have much the same appearance. These blood-corpuscles, together with the round or

spherical-looking epithelium of the tubules, in a more or less granular and broken-down condition, are formed into solid masses, which constitute casts of the uriniferous tubules, the connective matter being fibrine. Such plugs or tube-casts are commouly of a middle size and are made up of disintegrating epithelium, blood-corpuscles, and their débris, together with the fibrin, and are accordingly termed epithelial, blood, granular, or hyaline casts, according to the relative proportions of these. The existence of these plugs in the kidneys explains some of the symptoms. They of course obstruct the outward flow of the urine, and so that is diminished in quantity, whilst the increased pressure within the vessels favours the extravasation of blood-corpuscles and the transudation of the liquid elements of blood, with consequent diminution in the quantity of urea in the urine. From this same obstruction too we find in a short time transudation of fluid from the blood-vessels into the loose connective tissue of all parts of the body, beginning, as a rule, in the eyelids and scrotum, but soon showing itself in the feet, ankles, and hands, and thence spreading till all bodily shape is lost. Various theories have been advanced to account for this phenomenon, but the above is the most probable one. By-and-by, in favourable cases, the plugs begin to be washed away, and the urine to flow more freely, amounting to as much as three or four pints a day, whilst its specific gravity falls to 1012, or lower. The casts no longer show blood-corpuscles, but only broken-down epithelium, or are even hyaline—*i.e.*, purely fibrinous; the albumen diminishes, the urea increases, the skin grows moist, and the dropsy gradually disappears, so that in from a fortnight to six weeks the patient may be perfectly well. Sometimes convalescence is much more protracted; and the patient can never be said to be well until all trace of albumen has permanently disappeared from the urine. But, on the other hand, accumulation of nitrogenous débris within the system, due to arrest of the kidney secretion, may give rise to serious nervous symptoms. If the disease be very acute, and only a very small quantity of urine be secreted, these symptoms may assume from the first the comatose character; but if they come on more gradually, they usually manifest themselves by gradually increasing heaviness or sleepiness, suddenly diversified by a violent convulsive seizure, ending in coma. But such symptoms are more frequent in connexion with the

chronic form of the malady. In other cases the dropsical effusion is the symptom most to be dreaded; it gradually extends, invading the serous cavities, the peritoneal, pleural, and pericardial, in their order, until the individual is drowned in his own fluids. In these cases the anæmia is always intense, and the pale and swollen features are very characteristic, as is the attitude assumed, for with these cavities filled with fluid, both circulation and respiration can only be carried on under unusual difficulties, so that the patient sits upright in such a position as to afford himself every relief, and to utilize every muscle. Sometimes effusion into the submucous tissues of the larynx gives rise to sudden and severe dyspnœa and aphonia, occasionally ending fatally. In this œdematous condition, too, other accidents are apt to arise. The serous membranes are prone to inflammation, and this inflammation is too apt to prove fatal. The substance of the lung is also œdematous, and this too is apt to be seized with inflammation (pneumonia), a slight degree of which may end in death; but bronchitis is rare. On the other hand, the dropsical parts are peculiarly liable to erysipelatous inflammation, and this often proves a troublesome complication. On the whole it may be said that children are most liable to these inflammatory complications, especially pneumonia, whilst in adults, especially in those who have already waste tissue accumulated in their systems before the attack, convulsions and coma are more apt to prevail. Again, children recover sooner, and more completely, especially when the malady follows scarlet fever, than do adults, in whom an acute attack of Bright's disease is exceedingly—especially if coming on without any decided cause, such as exposure to cold or drinking—disposed to pass into the chronic form of the malady, or to lay the foundation for subsequent subacute attacks. We must not too readily, however, despair, for recovery does sometimes occur under the most unpromising conditions and after manifest albuminuria for a very long period of time.

Should death occur early in the disease, the kidneys are found larger and heavier than usual, in both respects sometimes nearly doubled; the surface is smooth, and when cut into they are found to contain much more blood than normally. The capsule is not adherent, but is very vascular. The cut surface, however, is not so intensely red as might have been expected, but rather a mixture of

fawn colour with redness, the relative amount varying. The cortical portion of the kidney is more manifestly changed than is any other, and in it the congested Malpighian bodies may be seen as dark-red dots. The reason this dark-red hue, the ordinary colour of congested parts, is not more diffused, seems to be due to the choking of the tubules with epithelium. This, mixed with blood-corpuscles, gives the fawn colour already referred to. There is in this form of the disease or in this stage of it, no alteration in the intertubular connective tissue; the epithelium of the tubules has alone undergone change, so that the mischief might be described as catarrhal. Later in the history of the disease this is not so: the contents of the tubules, as well as the tubules themselves and their connecting tissues, become altered. But under any circumstances the quantity of epithelium proliferated gives its characters to the kidney, so that it varies in colour from white to dark blood-red, but no doubt the stage of the disease has also a most important bearing on this.

Treatment.—In most cases the treatment of acute Bright's disease is satisfactory. Suppose you are called to see a child who, after a slight attack of scarlatina, has caught cold, and has speedily become swollen all over the body, whilst the urine is dark and scanty. You have an early case to deal with, and the measures should be correspondingly energetic. First, let the patient be placed in a warm bath, as hot as can be borne with comfort, kept in this for some time, then wrapped in warm flannel without drying the surface, placed in bed and covered over with hot blankets. In cases which can be more strictly traced to cold without the influence of any previous mischief, cupping over the loins is recommended on very good authority, but we may content ourselves with large warm poultices or hot compresses, or still better, a poultice of digitalis leaves. These measures should either be repeated, or varied by covering the patient with a blanket wrung out of warm water, and enveloping the whole in more blankets—in this respect modifying the practice, already alluded to, of applying the wet pack. Next to getting the skin to act, the most important thing is to get the bowels well opened. For this purpose the compound powder of jalap is the remedy commonly used, and should be given in from 10 to 30-grain doses, according to the age of the patient; but in no case should either the sweating or the purging be carried [illegible] as to interfere with the patient's strength. Anti[illegible]may be used in the form of antimonial wine or

compound antimonial powder, but in most cases it is unnecessary, and so is better avoided. As soon as possible we should endeavour to get the kidneys to act. This is best done by saline diuretics, especially the citrate of potash given effervescing, or the acid tartrate given in the form of a drink to be used by the patient when thirsty. Both should be freely used and given well diluted; but if the quantity of urine still continues small, it is better to employ something else in addition, especially the decoction of broom or the infusion of digitalis, either of which constitutes an admirable vehicle for the salines already referred to.

We have, however, the complications already mentioned to contend with. The dropsy may not yield to the diuretics or purgatives, and it becomes a question what next is to be done. We certainly do not get such good results from puncturing in renal dropsy as in that dependent on cardiac mischief, but it may be tried, especially where the connective tissue is loose, as in the popliteal space and scrotum, avoiding regions where tense fasciæ prevail. Too often erysipelas follows such punctures, but this is less likely to happen if the orifice forms of its own accord. In any case the edges of the orifice should be well greased, so as to prevent any irritation by the constant flow of fluid, for this greatly favours the inroads of erysipelas. When inflammation of the serous cavities sets in, we can do very little. Light flying blisters and poultices are the best remedies, but these intercurrent maladies too frequently run their course with exceeding great rapidity and severity, so that more energetic measures sometimes only exacerbate the mischief. Head symptoms are, if possible, still more unmanageable; the only hope rests in procuring a free flow of excrementitious matter from the body, by the kidneys, if possible; if not, in some other way. To this end therefore we may give elaterium in ¼-grain for a dose, or the compound powder of scammony. Most frequently the convulsions, if the mischief takes that form, pass away, but this may not be so, and chloroform has been known to exercise a good effect upon them if persistent. But chloroform requires to be used with caution, and still more is this true of opium, even in the form of Dover's powder, whilst mercury is not to be thought of.

The diet is an important thing in acute Bright's disease. We know well that nitrogenous elements accumulating in the body constitute one of its main dangers,

so we should abstain from giving meat, save in the form of broth and beef-tea, thickened with farinaceous substances, as much as possible. Milk, arrow-root, corn-flour, and the like are the best diet, in the first instance; but later, when the patient tends to become anæmic, we must be much more liberal in our dietary, though even then care must be exercised in its selection. Of still more importance in the advanced stage of the malady, when the patient has begun to improve, is the exhibition of iron. This should be begun cautiously, ten or twelve drops of the perchloride being given along with 20-grain doses of the acetate of potash, gradually diminishing the alkali and increasing the iron. Later, full doses of the perchloride of iron should be given, together with two grains of quinine in each dose. In all cases a change of air to a warm, sheltered locality should, if possible, be tried, and under any circumstances, a full suit of flannel next the skin must be insisted on, for the slightest exposure to cold or other indiscretion may bring back the albumen and the whole mischief in a subacute form, vastly more difficult to get rid of than the acute malady in the first instance.

CHRONIC BRIGHT'S DISEASE.

The term chronic Bright's disease has been given to a group of symptoms, chief among which is albuminuria, with or without dropsy, but dependent on a variety of morbid states. The most important of these are (1) the *large smooth* or *white kidney*; (2) the *small granular* or *contracted kidney*; and (3) the *lardaceous* or *waxy kidney*. We can, however, make out certain distinctions between these during life, so that it is best to describe them separately.

CHRONIC BRIGHT'S DISEASE, WITH LARGE WHITE KIDNEY.

We have already pointed out that the change in acute Bright's disease is mainly intra-tubular, that it consists in an enormous development of epithelium, which chokes the tubules, and which, if it persists long enough, finally undergoes fatty change. In this stage it constitutes the large white smooth kidney, which is therefore essentially the chronic form of ordinary acute Bright's disease. The kidney remains enlarged, but this is no longer due to over-filling with blood, but rather to the choking of the tubules. The

capsule is smooth, thin, and non-adherent, so that when stripped off no portion of the tissue comes away with it. On the naked surface stellate blood-vessels are seen in unusual abundance, the rest of the tissue being mottled with fatty and whitish lines. On section we see that the cortical substance is increased in quantity and altered in colour, being of a pale yellow or whitish appearance. The Malpighian bodies no longer project, but some are enlarged and their epithelium is cloudy, and the tubules on close examination are found to be filled with yellow-looking material. The central or pyramidal part of the kidney is not greatly altered; the cones are of the natural size and colour, but by contrast may appear redder than usual. The tubules themselves are seen to be choked with epithelial débris, the cells having undergone fatty change, and being frequently irrecognisable. In some parts the tubules are distended with this matter, giving rise to a varicose appearance; in others they seem shrunken. The Malpighian bodies are also fatty, but their vascular tufts are unchanged, whilst the inter-tubular structures seem at first little if at all altered, though later their tissues appear to be increased in bulk. Now this condition may last until death puts an end to the changes within the body, but very often, if the patient lives long enough, we have a third stage, that of atrophy. The fatty change of the tubular epithelium having become more or less complete, the material is absorbed and the kidney shrinks and may become, instead of unusually large, abnormally small; instead of being softer than usual, very much harder. In this stage the capsule, though often thickened and adherent, is not very greatly changed, and the degree of adhesion is slight. On removal the surface is seen to be irregularly depressed, so that it appears granular. Stellate vessels are also to be seen. The colour is still mottled, but much less so than in the earlier stage. On section the cortical substance is seen to be greatly shrunken, the pyramidal part having undergone but little change. There is much less of the yellowish or ivory-white matter to be seen in the cortex: but fat has often been deposited elsewhere than in the tubules, especially in and about the pelvis. The vessels in this stage are thickened, and between the tubules the connective tissue seems increased, but that may be due to the shrinking and obliteration of the tubules, which would give an appearance of an increase of the inter-tubular substance. The coverings of the Malpighian bodies too

are thickened. In this stage therefore the kidney greatly resembles that which is commonly called the granular kidney, which is, however, contracted from the beginning, and in which there is no preliminary choking of the tubules with consequent increase of size, to be followed by subsequent absorption and shrinking. The form just now described is that most frequently recognised on the Continent, where few observers admit the existence of a pure cirrhosis of the kidney, but assign in all cases to the contracted form a history of previous intra-tubular change and swelling,

In some cases where the kidney has been enlarged by inflammatory changes, there is little or no shrinking in point of size, but the whole tissues of the organ undergo fatty transformation. Oil globules form in the epithelium of the tubules, between the tubules, round the blood-vessels, in fact, in all parts. This is the most common variety of the so-called fatty kidney; but such fatty change may occur under any conditions; so that the term fatty kidney cannot be applied to any explicit anatomical change beyond the fatty transformation alluded to. The fatty transformation of the inflammatory products is most apt to take place when the inflammation has followed exposure to cold, especially in intemperate people.

The special indications of this form of renal mischief are, first of all, a history of an acute attack, either from cold, scarlet fever, or a drinking bout; but the onset is sudden and well-marked, not insidious and gradual. There is no complete recovery, and chronic albuminuria supervenes on the acute attack. The quantity of urine passed is decidedly less than usual, pale in colour, but of a nearly normal specific gravity; it always throws down a deposit, sometimes plentifully, and this consists of casts containing epithelial débris, very often fatty; whilst quantities of free epithelial cells, similar to what are commonly called pus-corpuscles, float freely in the fluid. Dropsy is an invariable symptom, but varies greatly in amount, and there is always marked anæmia. Hence the skin is smooth and glossy, without creases or wrinkles, and the surface in many parts puffy. Incomplete recovery is frequent, and the patients fancying themselves well, refuse to take due care of themselves, so that in a short time they are as bad as ever. In this form of kidney mischief there is a great tendency to secondary inflammations, and it is usually from one of these that the patient dies, though sometimes death happens with uræmic symp-

toms; but there is not the same tendency to repeated attacks of convulsions with intervals of comparative health as is seen in the granular kidney, neither have we enlargement of the left ventricle as in the other affection. Moreover, the mischief happens most frequently in young people, and when it does occur seldom lasts so long as does the granular form of mischief; there is more chance of recovery or of an early death.

The early signs of chronic Bright's disease are rather vague—especially as there is no pain or uneasiness beyond a slight degree of irritation about the bladder, which will not permit of the urine being retained as long as usual, and which, as micturition is consequently frequent, induces the patient to believe that he is passing more water than usual, whereas he has only been passing it oftener. The total quantity passed is less than usual, probably about 20 or 30 ounces in 24 hours. There is also anæmia, more or less marked, with consequent weakness and loss of mental and bodily vigour. The skin is dry, sometimes pallid, smooth, and shining; more frequently rough and sallow, or dirty-looking. But the most marked indications are to be found in the urine. This is usually pale yellow in colour, and containing a semi-solid matter, which is precipitated on standing. The urine too, which contains albumen, is more viscid than common, and so tends to froth more freely than usual, and the froth persists longer than in healthy urine. It contains albumen in very various quantity, sometimes enough to render the whole solid on heating, sometimes only the merest trace, not at all easy of recognition. As already pointed out, the plan for its detection is to take a portion of the urine, acidulate with a drop or two of acetic acid, and boil. This acidulation is the more necessary as in chronic albuminuria the urine is often alkaline, or readily tends to become so out of the body, and for its neutralization acetic acid is best. On the other hand, nitric acid has its advantages, and decidedly the best plan for detecting, and in a rough way estimating, a very small quantity of albumen, is to pour some nitric acid into a test-tube and then to let the urine run gently down the side of the tube from a pipette, so as to float it on the nitric acid, when, if albumen be present, a film of varying thickness will be seen to form at the junction of the two. If the quantity of albumen present be exceedingly small, it may be necessary to let it stand for a short time before the film forms. In a highly concentrated urine the nitric acid might form

a film of crystals of nitrate of urea, but this objection can hardly be said to be a practical one; such urines are rare, and albumen is not often found in them, for albuminous urine is usually of very low specific gravity, notwithstanding the presence of albumen in abundance. Albumen is not very heavy specifically, and its presence does not compensate for the absence of those substances which mainly contribute to give urine its specific gravity. The most important elements deficient in albuminous urine are urea (generally not more than 100 grains in twenty-four hours), possibly from diminished or imperfect tissue changes; and the alkaline chlorides. Owing to their absence the specific gravity of the urine may sink to little more than that of plain water, and it is almost always under 1012, often as low as 1005, though in the scanty secretion of the large white kidney it may exceed 1030; again it is greater when the dropsical effusion is rapidly disappearing. The quantity of albumen varies greatly, and is very difficult of exact estimation. It may be said to vary from a trace to as much as 300 or 400 grains in the twenty-four hours. The quantity eliminated is greater during digestion than fasting, and again is much greater at one period in the history of the disease than at another. How to account for the presence of albumen in the urine in such diseased conditions, and for its absence in the urine of health, is not at all easy; we can only refer it in some way to the influence of the epithelium, which is either absent or diseased when albumen is present; and to certain modifications of vascular tension. The deposits from the urine on standing are mainly, as already indicated, epithelium and tube casts, but the epithelium is never healthy; very often it is seen filled with granular matter undergoing fatty degeneration, or only the nucleus with a small portion of protoplasm adhering to it is to be seen. The casts are either epithelial or composed of the opaque granular débris of epithelium; sometimes, distinctly fatty and again purely hyaline and structureless, when they are often hard to be detected. The best way of obtaining these casts is to let the urine stand in a tall, tapering wineglass, and when complete subsidence has taken place to pour off the supernatant fluid. Then placing the tip of the finger on the end of a pipette, introduce it into the mass left behind, when the finger being withdrawn from the end, the semi-fluid material will rush in to the level it occupies outside the tube; the finger being again replaced, the

pipette may be gently withdrawn and the contained fluid allowed to drip down the side of the glass until a likely drop makes its appearance, which should be promptly transferred to the microscopic slide for examination. The differences in the characters of the casts which may all be found in the same individual case is, in part at least, due to the different degrees of change in different portions of the same kidney. In the early stages blood and epithelium are the main components of the casts; later, blood, except an acute attack has intervened, is rarely or never found; whilst in the most advanced stage, when the epithelium has been stripped off, the casts are for the most part large and hyaline.

Dropsy, as already indicated, is commonly present in this form of Bright's disease, the fluid effused being of low specific gravity, containing little albumen and a good deal of salts; sometimes also urea is found in it. The dropsy tends to shift its place from one part of the body to another, in this being influenced to a considerable extent, but not entirely, by dependent position. It is of very various amount, and often begins with only a slight manifestation, gradually becoming worse as the disease advances, but it is apt to vary from no very well known cause. As in the acute form, the face and feet are usually affected first, but this, together with relative amounts, is greatly influenced by the existence or absence of such mischiefs as heart disease and contracted liver. When these are present, the legs and serous cavities, especially the peritoneal, may be distended out of all due proportion. The exact mode in which the dropsy is produced is not quite clear, but it bears a certain relation to the amount of urine passed: when much urine is made, there is little or no dropsy, and *vice versâ*. Certainly it is favoured in more advanced cases by the thin and watery condition of the blood. For the blood suffers as the disease advances: it becomes poor and watery, deficient in red corpuscles and albumen—which at once favours transudation and retards reabsorption.

The occurrence of complications in chronic Bright's disease is to be looked for almost as a matter of course. Among these is ordinarily considered uræmia, though it is almost a natural outcome of the disorder. The nature of uræmia is hardly understood. Some have referred it to urea in the blood, hence the name; others to the conversion of urea into the carbonate of ammonia. Some have held

that the watery condition of the blood, favouring transudation into the brain substance, and cerebral anæmia, were its cause. We shall probably not be far wrong if we assign accumulation of effete products of various kinds, which ought to be eliminated, as its main factor. The symptoms of uræmia are peculiar; we hardly ever have delirium, though we have wandering—instead we have drowsiness or coma; we hardly ever have anything like paralysis—instead we have convulsions, sometimes of the severest kind. These symptoms come on sometimes abruptly and without warning, sometimes slowly, with increasing drowsiness, diminution in the quantity of water, and more especially of solids passed. Most frequently they begin thus: the patient complains of some headache, he is dull and listless, and hates being roused. When roused, he often gives wrong answers to questions, from apathy or misapprehension, which he does not care to correct. There is marked loss of memory and usually sickness; often there is most obstinate vomiting. He may lie thus for days, passing everything under him, and then suddenly become convulsed, or the convulsions may come on early and recur frequently—usually they are epileptic, much more rarely tetanic. The tongue is bitten, there is foaming at the mouth, and the eyes squint or roll upwards. Rarely does a single convulsion occur, much more frequently they occur off and on for some time at uncertain intervals. The coma is usually complete, but not always so in the intervals between the convulsive attacks. Sometimes these attacks prove fatal the first time they occur, but much more frequently they pass away, leaving the patient apparently better than before, but only to return again, though it may be weeks or months after. Sometimes the uræmic condition manifests itself suddenly, as coma only, the patient falling down insensible in the streets, when the mischief is liable to be confounded with opium poisoning, or alcoholic intoxication. Loss of sight is a frequent consequence of chronic Bright's disease, and it may be due either to purely nervous causes, coming and going with the uræmic condition, or it may depend on change in the retina, which is now described as albuminuric retinitis. The former is common enough in this form of chronic Bright's disease, but the latter is rare, save in that dependent on cirrhotic kidney, and when there is rupture of the retinal vessels with consequent extravasation of blood. In this last case, Bright's disease has not un-

frequently been first diagnosed by the ophthalmoscope. Deafness is much rarer than loss of vision from purely nervous causes.

Among the most important complications of chronic Bright's disease are inflammation of the pleura, pericardium, peritoneum, and meninges especially, as they are the most frequent causes of death in it. Pleurisy is most common; next comes pneumonia; and next, pericarditis. They are also most frequent in the earlier stages of the disease. Catarrhal inflammation, especially of the bronchi and alimentary canal, are very frequent concomitants of advanced Bright's disease. Œdema of the lungs, with copious watery expectoration and even true pneumonia, also occur; and end many cases. The œdema causes the expectoration of the bronchitis when that is present to be unusually abundant. The interference with the digestive organs gives rise to the vomiting already alluded to, and this we sometimes entirely fail to control, whilst the same condition extending to the intestine gives rise to copious watery stools, which, however, seem to have very little effect on the dropsy. The œdema of the lung, the watery expectoration, and the fluid stools are merely expressions of the general tendency to serous transudation. The œdema too helps to give rise to dyspnœa, which is sometimes severe, and then goes by the name of urinous asthma. Lastly, heart disease often complicates Bright's disease: the poisoned blood may set up endocarditis, and so give rise to valvular disease and hypertrophy with dilatation. The pure cardiac hypertrophy, especially of the left ventricle alone, is almost invariably associated with the small granular kidney of the cirrhotic kind, and so too most frequently is cerebral apoplexy. The prospect in confirmed Bright's disease is very gloomy; recovery rarely takes place; but, on the other hand, with due care life may be prolonged for many years, and all the functions of life fulfilled in tolerable comfort, notwithstanding the presence of albumen in the urine.

Treatment.—The treatment of this form of Bright's disease must be considered with reference to its normal tendencies. Dropsy is prone to occur; hence we direct the patient to wear flannel next the skin both night and day, to avoid cold and damp, cold draughts of air, and great variations of temperature. He should never go out at night or in bad weather, and should if possible change his abode to a warm, dry locality exposed to the sun all the year round, sheltered from cold winds, and so situate

that exercise in the open air is attainable at all times. Stimulants should be used with caution, and the manner of life should be as far as possible regulated with a view to carrying out these precautions. Whilst in the acute stage, as pointed out, animal food is best avoided, but when the malady has become chronic we must endeavour to make up for the constant drain of albumen going on by improvement in the diet, especially by giving strong soups, and other decoctions of meat, or plenty of meat itself in as digestible a form as possible. Digestion should be promoted by giving appetizing wines of the unbrandied class, or very dry sherry in moderation. But perhaps the best food we can give is plenty of good milk. Should there be a tendency to uræmia we must be somewhat more careful in ordering nitrogenous food; but these as a rule are precisely the cases which need it least. Can we do anything to stop the drain of albumen? is a question which has been often enough asked, but is not easily answered. Sometimes gallic and tannic acids have been given with a view to arrest this; but though some praise their efficacy, our own experience, like that of most others, is against their use. Far more useful in every way is the liq. ferri perchloridi given in half drachm doses every four hours, with or without quinine in combination with it. Where this does not suit, other preparations of iron must be tried: the citrate of iron and quinine is a very good form. So too are the phosphate and the reduced iron, though some patients take the alkaline preparations, especially the mistura ferri co., with greater advantage. These remedies seem not only to diminish the albumen passed, but to remedy or prevent the anæmia and favour general nutrition.

In this form of chronic Bright's disease, dropsy and its concomitants are to be dreaded; so we must strive to avoid them, first, as we have pointed out, by keeping the surface warm and the skin open by uniform warmth and a suit of flannel. Should dropsy show itself it is perhaps best combated by similar means, especially by warm baths, in all kinds of modification—hot air baths, vapour baths, blanket baths, or warm water. One very good plan, which can always be had recourse to, is to sponge the surface with tepid water, envelope it in blankets, and surround the body with hot bricks or warm water pans. When one plan fails another should be tried; but sometimes any form of sudorific seems injurious, espe-

cially when there is very great anæmia; in other cases they give rise to headache and other discomforts, but these cases are few—the benefit almost universal. Next to diaphoretics of the kind mentioned—the ordinary diaphoretics are useless—hydragogue purgatives are most valuable. The best are the compound powder of jalap in full doses and the compound powder of scammony. Rochelle salts and cream of tartar are also very useful, and are well given along with the compound rhubarb powder. Elaterium is as a rule too much of an irritant to the bowels. Should spontaneous diarrhœa come on it may be necessary even to employ astringents. The exact value of diuretics is not quite clear; some praise them highly, some speak of them disparagingly. Undoubtedly in some cases they do excellent service. Digitalis in the form of infusion generally proves useful; so does decoction of broom, but the alkaline salts, especially the acetate and citrate of potash, or its acid tartrate, given in the form of an electuary made with honey, are often extremely valuable. A good mode of giving cream of tartar is in buttermilk where that is attainable. Spruce beer is recommended as a beverage; it slakes thirst and acts on the kidneys. Oil of juniper is a good diuretic, and is best given by inhalation, a few drops being placed on a hot sponge, or inhaled from the usual kind of inhalers. Even tincture of cantharides has been tried, but is hardly to be recommended. The rules for making incisions to allow the fluid to drain away have already been laid down. The after treatment of these punctures is if possible more important than their mode of formation.

In bronchial catarrh and such like mischiefs we cannot do a very great deal; but inhalation of steam and hot poultices to the chest, with some mild stimulant application, as a mustard leaf for a few minutes, are often attended with good results. For the vomiting ice and small quantities of champagne are the best remedies: others must be used with caution. Should uræmia threaten, we can only try to favour the flow of urine or the expulsion of the effete materials in some other way, especially by the skin or by the bowels. Ice to the head too is frequently a valuable application. During the convulsive attacks chloroform should be given, but not to the extent of narcotism, only to control the spasms. When the uræmia takes the form of coma chloroform only does harm. Bleeding, which is quite admissible in the uræmia

of acute Bright's disease, is never admissible here, and though attended with momentary benefit, is sure to lead to ultimate harm.

CHRONIC BRIGHT'S DISEASE, WITH SMALL CONTRACTING OR GRANULAR KIDNEY.

Whereas in the form of chronic Bright's disease just described we sometimes find the kindney at first large but afterwards small and hard when the disease has lasted long enough, in that now referred to the kidney is never markedly enlarged from the beginning. The change consists essentially in a hypertrophy of the connective tissue between the tubules, and a consequent shrinking of the secreting substance; and this is no secondary change following on enlargement and intratubular disease, as is commonly believed on the Continent. When seen early, the organ is but little altered in size, but the capsule is thickened and adherent, so that the surface tears in removing it; but even apart from this, the surface is irregular, rough, and granular-looking, and the stellate veins are marked upon its surface. In more advanced stages the size of the organ has undergone diminution, its surface is more irregular, and the capsule more adherent; its texture is harder and firmer, and cysts are frequently seen on the surface. In some parts depressions are seen on the surface into which the capsule dips, so as to give it a kind of lobulated appearance. The two kidneys are most frequently of different sizes, one being more shrunken than the other, and when cut into it is seen that this is due almost entirely to wasting of the cortical portion, which may be only about a line in thickness, whilst the pyramidal portion is but little changed. The colour is dark-red and the texture coarse. There is no appearance of fatty matter in the tubules, but sometimes we find it tolerably abundant between them, so that there may be comparatively little shrinking in point of size. The arteries are thickened and tortuous and their lumen contracted, so that fluid does not pass so readily through them as through the vessels of the healthy or even of the smooth white kidney. The most marked characteristic, as seen by the microscope, is the great hypertrophy of tissue between the tubules, the tubules themselves having in parts disappeared, but in some parts seem dilated.

The Malpighian bodies seem shrunken, and lie like

knots in the centre of concentric masses of fibrous material. Among these altered tubules occur others but little if at all altered, with fairly healthy epithelial lining. Cysts, owing to dilatations of partially obliterated tubes, are very commonly met with; their contents are not urinous, but albuminous. This change in the kidney is almost invariably accompanied by changes in the smaller arteries, especially of the nature of a thickening of their walls. We find the muscular coat increased in thickness, but the adventitia is so also, and perhaps to a greater extent than the former, whilst there is, in some of the vessels, especially in those of the brain, an increased fragility which should not be overlooked. In the kidney itself all parts are not in the same stage of tissue change, the outer portion being generally more advanced than the inner, and so we have an opportunity of seeing the processes which are going on, and from which we must conclude that the mischief is mainly a form of degeneration in which inflammation has little or no place. For this reason the name of interstitial or intertubular nephritis, sometimes applied to the mischief, is not very appropriate. With this form of kidney disease we have in most instances enlargement of the left ventricle of the heart, and very often also important changes in the alimentary organs.

This form of Bright's disease has important clinical characters which we can hardly fail to recognise. It occurs in individuals about or beyond the age of forty, in whom, otherwise, degeneration is apt to occur, especially from their mode of life, as habits of intoxication, or in the subjects of gout. In it very often the first intimation of illness is blindness from albuminuric retinitis, or a convulsion, or an attack of coma, so insidious is its approach. Dropsy is never a prominent symptom; in a great number of cases it is entirely absent. When dropsy does exist, it only amounts to an inconvenience from tightness of the boots at night, and a puffiness of the eyelids, or a moist, watery eye. These signs of dropsy go and come again without obvious cause. On inquiry the urine seems to be unusually abundant, though late in the disease it is very scanty, the patient having to rise frequently during the night, and passing a pale, limpid urine of low specific gravity (1005 to 1015). Thirst and indigestion are usually complained of. When examined for albumen only a trace may be discovered, and that too is not invariable, being found one day and gone the

next, and as there is but a very scanty deposit, casts are not readily detected. The casts are hyaline, rarely epithelial, but sometimes granular; hardly ever bloody, save an acute attack supervene on the chronic state. The surface, though anæmic, is rather sallow than pallid, and is dry without puffiness. Headache, especially about the crown of the head, is a regular and very distressing symptom. On examination the heart will usually be found to beat outside the left nipple; the second sound over the aorta is short and sharp, and the pulse gives evidence of high vascular tension, owing to obstruction to the onward flow of blood by the thickened vessels. In the advanced stage there is great debility, and there is a great tendency to uræmic symptoms, sometimes very severe in their character, and often ushered in by a fall in the specific gravity of the urine and a diminution in its quantity. Cerebral hæmorrhage too is a frequent cause of death in this form of Bright's disease, depending on increased power in the heart, and fragility of the arteries. The rupture of retinal vessels and the neuro-retinitis which follows depend on similar causes. Acute inflammations of a most obstinate type, or acute œdema of the lungs, are other modes by which this form of disease tends to terminate. The uræmic attacks may recur again and again without fatal issue. In a goodly number of cases of Bright's disease of this kind there are also cirrhosis of the liver and atheroma of the blood-vessels. Even the spleen may be hardened.

The *treatment* of this form of Bright's disease is even more unsatisfactory than of the last. The food must be carefully selected, and should not contain too much meat; there is no great drain of albumen from the system here. On the other hand, we should endeavour to promote elimination of effete material; this is best done by giving plenty of pure water and alkaline salts, especially the citrate of potash in the effervescent form. Potash or lithia water, with a little claret, forms a good drink. Should the quantity of water passed show signs of diminution, the warm bath should promptly be used. Iron is of especial value in this form of the disease—it relieves the headache and wandering pains. If convulsions come on, chloroform had better be used to mitigate their violence, but we must have patience, for it will not drive them away. If the vessels are suspected of degeneration, all unusual

strain upon them should be, as far as possible, avoided. It is in this form that change of climate is most beneficial; the spot selected should have an equable and dry atmosphere.

CHRONIC BRIGHT'S DISEASE, WITH LARDACEOUS OR WAXY KIDNEY.

The so-called amyloid change not unfrequently affects the kidneys and gives rise to the symptoms of Bright's disease. Amyloid change begins in the vessels, especially the Malpighian tufts, thickening their walls, but rendering them more permeable, so that at first the other tissues of the kidneys are not greatly altered. The size of the organ is rather larger than usual, the capsule is thin and readily peels off without tearing the tissues, the surface is smooth, and there is no wasting either of the cortical or medullary portion of the organ; but the cortex contains less blood than usual, and the Malpighian bodies look like bright glistening points. The microscope shows the arteries to be swollen, translucent, and thickened, so as to have a kind of knotted appearance. When a solution of iodine in iodide of potassium is applied to the cut surface, these points and vessels come out conspicuously in mahogany red, contrasting with the yellow staining of the iodine. In the more advanced stage the organ is larger and heavier than natural; it is smooth and pale, not mottled as in the inflammatory form of the disease. The cortical portion on section is smooth and glistening, like beeswax, dotted over with translucent points. The tubules are now affected; they are filled with matter consisting of hyaline or fibrinous material and epithelium in a state of granular or fatty change, but this never yields the iodine reaction. The substance of the tubules may, however, be changed so as to do so. To this change in the tubules and blood-vessels is due the increase in size and weight alluded to. In the last stage the organ is smaller, and the surface rough and granular, but the capsule is very slightly adherent; the cortex is diminished, the pyramidal portion unchanged in point of size. The tubules have wasted; the arteries are dilated and thickened, so that the Malpighian bodies seem much more numerous and closer together than natural; but this change is long in taking place. Other organs, especially the liver and

spleen, are usually affected in the same way as the kidneys, and yield the same amyloid reaction.

The history of such cases too is characteristic. Most commonly they follow prolonged wasting disease, as caries or necrosis of bone, and constitutional syphilis. The mischief comes on insidiously, with signs of weakness and a tendency to drink and pass a large quantity of water—that passed not unfrequently exceeding in amount the quantity absolutely drunk. The patient has to get up several times in the night, and is thirsty as well as desirous of making water. The urine passed may amount to as much as 200 ounces a day, and this, too, long before it becomes albuminous. Dropsy, in the form of swollen feet and ankles at night, disappearing with a night's rest, comes on pretty early in some cases, in others not so. But as a rule the urine diminishes in quantity and the dropsy comes on *pari passu*, but the latter varies greatly in amount. The urine at first contains no albumen, afterwards a trace, and as the urine diminishes in quantity it becomes more and more albuminous, but of rather low specific gravity, not exceeding 1015, but not so low as in some other forms. The urine is pale in colour, sometimes of a peculiar yellowish-brown, and, containing much Indican, its deposit is small in amount, so that casts are not often detected. They do not give the so-called amyloid reaction. There is in uncomplicated waxy kidney but little tendency to uræmia, for plenty of urea is passed; but the waxy kidney, like the cirrhotic kidney, is apt to become inflamed, and then all the evils of uræmia are speedily developed. Much more commonly the patient dies from protracted diarrhœa, the consequence of waxy change of the intestines, or from phthisis, or from the wasting malady which has inaugurated the waxy change. Very often it is only after death that it is found that the kidneys are waxy. Hypertrophy of the heart, and inflammations of serous membranes are rare in the waxy form of Bright's disease, and lung affections are not so common as in the others.

The *treatment* of the waxy degeneration of the kidney should commence with, as far as possible, arresting the exhausting malady that seems to be leading up to it. Hence operative interference is often necessary. The diet should be good, and tonics, especially iron and the mineral acids, freely given. When dependent on syphilis, iodide of potassium in 30-grain doses, in bark and along with aromatic spirit of ammonia, should be given, and the patient have

as much cod-liver oil as can be digested. The dyspepsia and diarrhœa should be dealt with by means of iron and strychnine along with nitro-hydrochloric acid; the diarrhœa with chalk, opium, and acetate of lead. Nitrate of silver, too, often does good. Cathartics should always be used with caution in this form of the malady. Change of climate is highly desirable. Even in the worst cases improvement may thus be hoped for.

ABSCESS OF THE KIDNEY.

True abscess of the kidney is to be distinguished from mere accumulation of pus in its pelvis, now commonly called pyo-nephrosis. It may be brought about in a variety of ways—first, by direct injury or contusion, which is rare; secondly, by inflammation ending in suppuration dependent on the presence of a calculus, which is much more common. Perhaps even a more frequent causation is that due to accumulation of urine, and its undergoing decomposition when there is obstruction in the ureters or in the bladder, as by an enlarged prostate or urethral stricture; or yet again, when there is paralysis of the bladder, as happens in some cases of paraplegia. In this set of cases the irritation and inflammation usually creep upwards along the ureters from the inflamed bladder, and so from the pelvis of the kidney to its substance, ending in diffused abscess of the latter. But the exact means of propagation are in many cases far from evident, especially as when injury to the urethra apparently gives rise directly to suppuration of the kidney without any of the usual intervening links. The abscesses produced are generally small and diffused, but sometimes unite to convert the kidney into a mere bag of pus. Multiple abscesses again may be produced in pyæmia as they are in other organs; and finally embolism may give rise to them. The emboli may originate in the heart from ulcerative endocarditis, and being conveyed by the blood, are arrested in various organs, and there set up fresh mischief, especially in the kidneys.

When the kidney becomes inflamed by direct extension of the mischief from other parts, we find it first enlarged and reddened, the deep redness being sometimes universal, sometimes in spots. In the red parts the consistence is less than usual, and the structure indistinct; a

thick bloody fluid issues from the cut surface, whilst the capsule, if they be near the surface, is thickened and less adherent than usual. Before long the redness becomes mixed with yellow from the formation of pus, so that the colour is dirty-brown in diffused specks of no great size. These speedily break down, and so small detached abscesses are formed, varying in shape according to position—rounder in the cortex, more elongated in the pyramidal part of the organ; but by breaking down of the intervening tissues the isolated abscesses tend to coalesce, and soon form the collections of pus referred to. These abscesses tend to open in various directions, the most favourable being into the pelvis of the kidney, whence the pus can escape by the ureter. Under less favourable circumstances they may open into the cavity of the abdomen, into the adherent intestines, or into the surrounding connective tissue, forming there a peri-nephric abscess, which may burst either outwardly or into the pleura. But such a course is not invariable; the abscess may become encapsulated, the pus gradually thicken, and form a cheesy or putty-like mass, or even be totally absorbed, leaving behind only a half-destroyed organ and a mass of cicatricial tissue. The history of abscess from plugged vessels is usually somewhat different: ordinary fibrinous plugs do not of necessity give rise to inflammation, but the blocking of the vessel gives rise, as usual, to collateral engorgement, so that the branches of the vessel beyond the plug become distended with blood. Hence these engorgements are wedge-shaped, the apex pointing towards the pelvis of the organ. They are most common in the cortex. The infarct after a time undergoes change in the centre, it begins to turn yellow, and sometimes softens by fatty change; it may be finally absorbed, leaving a scar behind. Where the infarct is of a different nature, as happens in pyæmia, the course pursued is more serious; usually then the infarcts are more numerous and smaller, and each becomes the focus of a fresh inflammation ending in abscess.

In marked distinction to the ordinary or tubular form of renal inflammation, this kind is sometimes attended by severe pain, introduced by rigors, which are prone to recur, the pain extending from the back downwards and forwards to the testicle and thigh on the affected side. Besides the pain there is often tenderness and severe vomiting. The urine is often bloody, or, without blood, it may be albuminous. But this is not an invariable

phenomenon. If the abscess open into the pelvis of the kidney the urine will of course contain pus in large quantity. Very often signs of blood-poisoning manifest themselves, and the patients become comatose or convulsed. When more chronic, the frequently recurring rigors may be the only symptoms of the existence of pus in the kidneys. Or, again, abscess may follow abscess till the patient dies exhausted. The symptoms of renal infarction are not usually very well pronounced, especially if small; but if very large it may give rise to severe pain in the organ affected, extending down the groin and thigh, and may even interfere with the secretion of urine.

Treatment.—Where the renal abscess is due to spread of inflammation from the ureter, we can seldom do much for its relief if we cannot also remove the cause. But we may do something to relieve the symptoms by the application of hot poultices frequently renewed, by cupping or leeching, by opium if there be no uræmic symptom, and absolute rest. Should there be any signs of pointing, or should we be sure of the existence of pus, we should evacuate it as early as possible, and this is best done, as in abscess of the liver, by a fine trocar and aspirator. The operation is even safer than in the liver, as no peritoneum need be pierced. But as regards operation, no absolute rule can be laid down, and each case must be dealt with on its own merits.

PERINEPHRIC ABSCESS.

When, as we have seen, an abscess of the kidney opens outwardly into the connective tissue surrounding the organ, fresh inflammation is set up, and a renewed formation of pus gives rise to what is called a perinephric abscess. Much more rarely the perinephric abscess is a primary affection. The symptoms resemble those of renal abscess as far as rigors, fever, pain, and tenderness are concerned, the last being a very prominent symptom. If the perinephritis be pure and simple there will of course be no alteration in the urine, but such a coincidence is rare, the abscess being usually secondary. The quantity of pus formed is soon exceedingly great, and the back becomes brawny, though fluctuation may sometimes be detected. The abscess tends in most cases to open into the pleura or into the peritoneum, but sometimes

points externally, or again it may follow Poupart's ligament and open in the groin; all these accidents should be avoided. As soon as it is clear that pus is in or around the kidney, we should perforate by a fine hollow needle and draw off the fluid, repeating the operation if necessary. In most instances this treatment is quite successful, supposing the abscess to arise from a temporary cause; but if the cause be persistent we can only hope to relieve for the time being, but the relief afforded is very great and very grateful.

PYELITIS AND PYONEPHROSIS.

Pyelitis, or inflammation of the pelvis and calyces of the kidneys, may arise in very various ways—irritant substances contained in urine, as cantharides, or abnormal conditions of the urine, as in diabetes and chronic Bright's disease, may give rise to it. Still more frequently it arises from local irritation, as the presence of a calculus, stagnant and decomposing urine, or by gradual extension of inflammation from the bladder. The affection itself may be either acute or chronic, and may occupy both kidneys, or only one of them. When acute the lining membrane is injected and perhaps ecchymosed; in the chronic form the membrane of the pelvis is thick and opaque, and of a dead white or slate colour instead of being injected as in the early stage. The pelvis too may be greatly dilated, encroaching on the substance of the kidney, which is as it were gradually flattened out and forms part of the wall of the sac, or by yielding at one point and resisting at another is converted into a multilocular sac containing purulent fluid. The distending power is in part the urinary secretion, which being prevented by a calculus, blood-clot, or other mechanical obstacle, from reaching the bladder, gradually accumulates till a large tumour is formed at the expense of the kidney, and which is filled with a mixture of urine and pus. Sometimes, but rarely, this fluid escapes in various directions, outwards through the skin, into the intestine, or into the peritoneum. When the urine becomes ammoniacal the triple phosphate is deposited, sometimes so as to give a mortar-like appearance to the contents of the sac, or even to form concretions within it. Sometimes again the fluid is gradually absorbed till a putty-like mass remains behind the septa, formed of the remains of the kidney, even calcifying.

There is always more or less pain, and generally some tenderness in pyelitis, the pain affecting one or both sides, according as the affection is single or double. The urine in the acute attack generally contains some blood and mucus, and the curiously shapen cells of the epithelial lining of the pelvis all more or less altered and otherwise irregular in form. There is not much albumen except for the blood. Later on there is pus in the urine, and if the urine can still escape it is often foul and decomposing. According as the pus can escape or no, so the subsequent symptoms vary. If the pus escapes regularly, the urine always contains more or less of it; but sometimes the ureter is obstructed for a time, and then the urine may be quite clear, but this is followed by the discharge of an increased quantity of purulent fluid. During the period of this obstruction the pelvis swells and dilates, constituting the condition called pyonephrosis; but if the obstacle is removed the swelling promptly subsides with a copious discharge of purulent urine. When the pus has collected for a time we generally have rigors, recurring at more or less regular intervals; and later there is hectic. The bowels are irregular, sometimes loose, sometimes confined. Most frequently pyelitis ends by exhausting the patient, from the continued discharge, but if pyonephrosis result, death may follow from the bursting of the sac.

The *treatment* of pyelitis depends greatly on the cause. When from irritants, urinary diseases, and the like, we must deal rather with the cause than the pyelitis. When from obstruction or extension of inflammation we can do little. To relieve the pain we make use of hot poultices and fomentations with laudanum, the hot hip bath, cupping, and copious warm drinks. Later, when the purulent discharge is established and persistent, we must try astringents, as alum, lead, and perchloride of iron, with good food and cod-liver oil to neutralize the effects of the drain. When there is an accumulation of pus we must be guided by circumstances; but if we must tap, we should do it by means of aspiration.

HYDRONEPHROSIS.

Hydronephrosis, or what might be termed dropsy of the kidney, is not at all a common malady, yet sufficiently so to deserve notice here. It arises thus: some obstacle exists to the flow of urine from the kidney by means of the

ureter, and distension of the urinary passages above the obstruction takes place. But this distending force mainly falls upon the pelvis, which consequently dilates, the substance of the kidney is compressed and atrophies, until only a hollow bag, filled with more or less urinous contents, represents what was both kidney and pelvis. Sometimes suppuration occurs, and then we have a bag filled with a mixture of urine and purulent matter, the condition described as pyonephrosis. When the obstruction is congenital the former condition—that is, pure dropsy—is most likely to prevail; if the obstruction be accidental and occur suddenly in later life, still more certainly if the confined urine undergoes decomposition, the latter arises. Both forms, if at all chronic, are apt to be mistaken for ovarian dropsy. The degree of change observed in different cases varies greatly, especially according to the stage of the mischief. It is rare to find both kidneys affected, usually only one is so, the other undergoing compensatory hypertrophy, and so fulfilling the functions of both; but it is evident that such a condition is a serious one, inasmuch as any damage to the remaining kidney may be followed by fatal results. Nevertheless in some extraordinary cases both kidneys may seem almost totally disorganized, and yet life be carried on comfortably in every respect. The size of the hydronephric cysts is sometimes very great, and, as already stated, their contents vary; sometimes we find them mainly urinous, *i.e.*, contain urea, uric acid, and other constituents; but in most the fluid is more watery and contains only a trace of urea, whilst it is almost invariably albuminous and often variously coloured. Occasionally the contents are found semi-solid.

When the hydronephrosis is congenital, it is very often associated with other bodily imperfections or anomalies: sometimes the ureter is imperforate, sometimes it is covered and compressed by a vessel, sometimes the ureter opens into the pelvis in a valve-like fashion, or rather with the peculiar-like curve employed for trapping the drains of water-closets. In the last case the obstruction would increase up to a certain point and then diminish, and this probably accounts for some of the histories of enormous quantities of urine being passed when, shortly before, the bladder has been examined and found empty. Cases do, however, occur in which no such origin can be assigned, and indeed where no mechanical mode of accounting for the distension is practicable.

The signs of hydronephrosis are, until the tumour becomes large enough for detection by physical means, obscure enough. Then we find a swelling on one side of the abdomen—back and front; backwards reaching the spine, in front to the umbilicus, and extending upwards beneath the ribs; downwards into the pelvis. In front of it lies the colon. The tumour is soft and fluctuating, and if it suddenly diminishes with an abrupt and excessive flow of urine, we may be sure of the nature of the tumour; but diagnosis is not always possible and such sacs have been perforated for ovarian tumours. It gives rise to no pain or other inconvenience than arises from its bulk; but sometimes it is tender, and it may obstruct the regular action of the bowels if the colon be much stretched over it.

If arising from the presence of a calculus, there may be attacks of the nature of calculous colic, and if any urine is then passed it is bloody and contains small coagulated masses of blood. If pus be contained in the sac, any urine which makes its way out will be more or less purulent, and there will be the usual signs of purulent collection, especially shivering, from time to time.

The *treatment* consists in endeavouring to get the tumour to empty itself, and if this fails, to empty it by aspiration. If due to an impacted calculus, the treatment should be directed to its removal; if to any other obstacle, it may be possible, by gentle manipulation, to overcome it, as has more than once been done. If all fails then we must tap with a fine needle and draw off in the usual way. As the colon lies in front, the perforation is best made from behind, near the points of the floating ribs.

CYSTIC CHANGE OF THE KIDNEY.

Small cysts are common enough in the kidney, and no doubt depend on obliteration of a tubule at some point of its course, giving rise to distension of the blind extremity with the natural secretion or blood serum. Such are plentiful in the small contracting kidney of chronic Bright's disease. If many of the straight tubules be obstructed, or if their orifices into the pelvis be closed, the whole kidney may be more or less affected in such a way, and this seems to be the explanation of many of the causes of congenital cystic kidney recorded. In adults we may also have cystic degeneration as it is called, and this too probably depends

on some similar changes—obliteration of certain of the tubules, dilatation of their remains by accumulation of secretions, with consequent pressure on and atrophy of the otherwise healthy structures of the organ. Consequently these cysts do not open into each other, nor do they communicate with the pelvis of the kidney save by suppuration. The fluid which they contain is not, however, of the nature of urine, but is commonly albuminous and often coloured by altered blood; sometimes the contents are gelatinous.

During life there are no very marked signs of the mischief. Urine continues to be secreted by the portion of the kidney which remains healthy, and as the contents of the cysts do not escape, the urine which is passed is nearly normal, except that it is said to be of low specific gravity. Albumen is found in some cases, and in a good many blood also appears. Death may occur in various ways; but if from the disease itself, then coma and convulsions suddenly come on and speedily terminate life. Should the condition be diagnosed during life, we should endeavour to avert such a consummation by regulating the diet and giving as little nitrogenous food as possible, whilst keeping the bowels freely open and promoting the elimination of bodily refuse by a free consumption of water.

HYDATIDS OF THE KIDNEY.

Hydatids occur in the kidney as in other parts of the body, but are not very common—at all events much less so than in the liver. The natural history is the same: the ova of the tænia echinococcus make their way into the human body with food or drink; arrived in the stomach, their coverings are dissolved, and the young worm set at liberty finds its way mainly by the blood current, to various parts of the body. Here the worm grows and envelopes itself in a vesicle, in which other echinococci are developed, and these again give rise to others. As the hydatid grows, it is surrounded by a thick, almost cartilaginous capsule, within which lies the true hydatid cyst. As in the case of the liver, various accidents may give rise to changes in the cyst, and consequent death of its contents, so that only the hooks and transformed remains of the parasites may be found in or extruded from the organ. Sometimes these hooklets are expelled

along with the urine, and so give evidence of the past or present existence of a hydatid cyst in the kidney. The left kidney seems to be more frequently the site of hydatid disease than the right.

When examined we usually find the cyst in the substance of the organ, but if it increase greatly in size, it may cause complete absorption of the kidney. According to its position it tends to a greater or less extent to open into the pelvis, and this in most cases happens sooner or later, but not invariably. The rupture may be hastened by accident, as by a fall or blow, but opening into the peritoneum under any circumstances is not recorded. If it opens into the pelvis the vesicles begin to be discharged along with the urine, sometimes entire, and giving rise to the symptoms of renal colic; or broken-down, and causing a turbidity in the urine, the nature of which is recognisable by the detection of the hooklets by the microscope. The signs other than these, which are conclusive, may or may not be pronounced. Till the tumour attains a considerable size, except rupture take place, nothing can be made out; but by-and-by we have manifested the various signs of a renal tumour, rounded, elastic, and fluctuating. In a few cases the peculiar thrill of hydatid cysts has been made out. It is important to bear in mind that the colon is not invariably in front of a hydatid tumour of the kidneys. It may happen that suppuration follows injury to the cyst: then we would have these signs combined with those of suppuration and retained pus. The tendency in hydatid disease of the kidney is to recovery in the way mentioned; after bursting there is less and less discharge, but this discharge may go on for a very long time without a perfect cure following. Sometimes the sac opens into the lungs—a less satisfactory mode of termination.

The *treatment* of such forms of disease is generally simple enough—let them alone. But should from any cause interference become necessary, then we may proceed to puncture the sac by a fine needle, and draw off a small quantity of fluid which is sufficient to insure the death of the parasites. When rupture has taken place and pain arises from the passage of the hydatids, opium, with antimonial wine and warm baths, are the best means of facilitating their transit.

MALIGNANT DISEASE OF THE KIDNEY.

Malignant disease of the kidney, as in most other organs, may be either primary or secondary. Primary malignant disease is most frequently of the soft or medullary kind, or sarcomatous. Scirrhus is rare, and colloid still rarer. The malignant growth is usually very soft, and often contains effusions of blood in its substance. Malignant disease of the kidney may occur at any age, even in very young children, but it is on the whole most frequent in adults. The new growth is sometimes in the form of isolated nodules, sometimes disseminated or infiltrated, but the nodular form is most common. In this way an irregular tumour is formed, sometimes of great size. The mass may be so soft as to give the idea of fluctuation; but this is not very common, except when blood has been effused into its substance. As the tumour grows it tends to involve adjacent parts, especially the lymphatics in the hilus of the organ and near the spine, and the mesenteric glands. Frequently the testicle is also affected along with the kidney.

The mischief may long remain latent, gradual wasting being the first indication of anything wrong. But in a goodly number of instances there is pain in the loin and groin, intermittent and shooting down the thigh, but without retraction of the testicle. But both pain and tenderness may be entirely absent, the mass giving inconvenience from weight and size only. Urine is secreted in fair quantity, and may contain neither albumen nor blood, but hæmaturia is usually one of the most frequent symptoms. The colon lies in front of the tumour and is stretched over it; this may give rise to obstruction, so that the bowels are confined, and when moved are as a rule and of necessity loose, or there is no passage. The pressure of the tumour on the cava may give rise to dropsy, but this of course is not constant or certain. As in other forms of renal mischief the stomach is often irritable, and nausea and vomiting are frequent concomitants, but both may be entirely absent. The most certain indications of renal cancer, therefore, are tumour and hæmaturia. The tumour varies in size —in children it is often very large; and owing to the thinning of the abdominal walls due to emaciation, can usually be readily made out. The tumour is fixed and irregular in shape, lying between the crest of the ileum

and the floating ribs. As it grows it inclines downwards and forwards. The bleeding from the kidney in cancer is in most part due to rupture of the vessels in the soft new growth, and is irregular in its appearance —sometimes profuse, sometimes scanty, sometimes traceable to injury, often due to no assignable cause. If clots form they give rise to severe suffering whilst passing the ureter and urethra. Profuse hæmorrhage will of course hasten the appearance of the so-called cancerous cachexia and debility, and may even cause death. The presence of albumen other than that due to blood in the urine is accidental, as when the kidney for some reason is not acting aright. Statements as to cancer-cells in urine are not to be relied on, the normal epithelium of the pelvis, ureters, and bladder being too varied in shape to allow of any decided opinion being given.

As to the *treatment* of cancer of the kidney, as of cancer elsewhere, we can say nothing. We can only treat symptoms as they arise, and in every way smooth the path of the patient to his inevitable doom. The removal or breaking down of coagula constitutes an important duty whenever they form; copious alkaline drinks and the use of the catheter if within reach are the best means at our disposal.

Secondary cancer of the kidney hardly deserves consideration, though sometimes it gives rise to peculiar symptoms.

RENAL CALCULUS.

In the kidneys of newly-born children it is not a rare thing to find brownish looking streaks running in the direction of the straight tubules, and most abundant near the papillæ. These brown streaks consist of deposits of urates occurring either before or after death, and are spoken of as uric acid infarcts. Sometimes they are composed of different materials, as oxalates, but uric acid, or urates, are the most frequent kind encountered. They may even be formed of crystals of hæmatoidin. The subsequent history of these, if the individual had lived, would, as other cases show, be very various; they may become encysted where they are formed, but most frequently are driven along into the pelvis of the kidney, where they may become the nuclei of other and larger masses. When retained in the pelvis of the kidney they may become very large and moulded to their situations. They are in all

numbers, from one to a very multitude. They may give rise to all kinds of mischief if they remain in the kidney—pyelitis, pyonephrosis, and abscess, but if they begin to move they may, if that be possible, do more harm. Many renal calculi give rise to no symptoms, even though large enough to cause partial atrophy of the organ, but in most cases we have well marked signs of their existence. First we usually find them producing a good deal of pain, sometimes increasing to paroxysms of agony. This pain is shooting, and tends to pass downwards along the ureters to the testicle and thigh. The testicle is retracted, there is intense nausea and vomiting, and a great feeling of faintness. There are frequent calls to make water, but after passing the drop or two which come away, this gives no relief, but tends to bring on an unbearable pain at the point of the penis. Sometimes blood passes with the water. All this may arise from the mere presence of the stone in the pelvis of the kidney, but in making its way to the bladder it usually sets up the same symptoms with tenfold severity till the patient shrieks with agony. The pain is not constant, but comes on in fits, or even gives rise to convulsions. In other cases it constantly increases, until, when the concretion passes into the bladder, relief, as sudden as the onset of the symptoms, occurs. Occasionally the calculus becomes impacted, and then the pain is slow in subsiding, but ultimately does so, but the impaction may be followed by abscess, pyo- or hydronephrosis. If the other kidney is not in working order the impaction of a calculus soon leads to death. During an attack of renal colic the pulse is quick, there is great thirst and other indications of fever, but they, too, soon pass away. In most cases the attack of colic passes off in a few hours, but with even complete obstruction to both ureters the patient may live more than a week. When the calculus has reached the bladder it may only be to set up fresh mischief there, but sometimes even large calculi are passed by the urethra. There is no exact relationship between either the size or the shape of the calculus and the attacks of colic. These fits seldom cause death directly, though impaction may end fatally either by direct or indirect means.

Treatment.—The treatment of renal calculus resolves itself into two parts—we must try to get rid of the concretion, and if colic occur we must treat its symptoms as they arise. First, if from feeling of pain or aching in the loins, aggravated by jolting, and then attended with

bloody urine, particularly if small calculi are known to have been passed, we come to the conclusion that we have to deal with a case of renal calculus; we must try to get rid of it, especially by means of solvents. Undoubtedly these do good in some cases, and the best of all, as being adapted to all cases, is abundance of pure water containing no saline ingredient. The most frequent kind of calculus is uric acid, or urates (with or without a coating of phosphates)—oxalate of lime is rarer. These occur with an acid state of the urine, and the former especially are associated with gouty proclivities. If the urine be alkaline from the presence of unneutralized potash or soda, we may have the bone-earth calculus, or one composed of carbonate of lime, but both are exceedingly rare. The much more common condition of urine, alkalinity from the conversion of urea into carbonate of ammonia, is sure, if any concretion be present, to give it a coating of triple phosphate. The other forms of calculi we need not discuss. Now each of these two great varieties requires a peculiar mode of treatment in some respects, but pure water is applicable to all, and is valuable alike for prevention and for cure. If the tendency is to form uric acid, as much exercise as possible should be taken. The food should be plain, and contain as little meat as possible; beer and sweet wines should be studiously avoided. Potash should be given, but in the form of citrate, given effervescing (bicarbonate of potash and citric acid) with abundance of water night and morning. We cannot do much with oxalate of lime, but we can at least avoid hard waters, rhubarb, and sorrel in any form. The phosphates again require the use of mineral acids. Thus it will be seen that the solvent and preventive treatment of different kinds of calculi require exactly opposite remedies; but if we can make no other diagnosis than that of the presence of a calculus of any kind, we are perfectly safe in giving plenty of pure water. If we can make a diagnosis of uric-acid calculus, we should give the acetate or citrate of potash (40 to 60 grains for a dose) in four ounces of pure water every three or four hours. It is plain no such treatment is applicable if the urine be already alkaline. If, on the other hand, we have reason to believe that the concretion is in part phosphatic, nitric acid, or the nitro-hydrochloric acid, should be given as freely as circumstances admit.

If the renal calculus be complicated with renal abscess or pyelitis, these will demand primary attention. If the

abscess has pointed externally it may be possible to withdraw the stone by an artificial opening.

When, from whatever cause, the renal concretion has entered the ureter and the attack of renal colic has begun, our treatment must be prompt. The patient should be placed in a warm hip bath, as hot as he can bear it, and a full dose of morphia administered subcutaneously. The dose should be repeated till the eyes show the influence of morphia and the pain is relieved. To moderate the pain till this has time to act, a mixture of chloroform and ether should be inhaled, or the former drug given by itself—not to create insensibility, but to dull the terrible pain. Let the patient also drink plenty of hot water, with or without any medicinal agent in it, for this will foster the flow of urine and relieve the irritable bladder. Hot poultices, or spongio-piline with belladonna, over the loins, when the patient has been removed from the bath, should be freely applied and frequently repeated; but, however hard to exercise, patience is in all cases necessary. We can only hope for permanent relief when the calculus has reached the bladder, or if it be of any considerable size if it has been again sent back to the pelvis of the kidney. Sometimes inverting the body has this effect, but such cases must be very rare.

HÆMORRHAGE FROM THE KIDNEY—HÆMATURIA.

Bleeding from the kidney may be brought about in many ways—by direct injury, by inflammatory affections, and by the presence of calculi, cancer, and parasitic worms. It may also occur in cases where the blood or the blood-vessels are greatly altered, as in purpura, in the so-called hæmorrhagic diathesis, and the like; but these are far from covering the whole ground.

At best, hæmorrhage is but a symptom, and it is not always easy of detection, especially if only in very small quantity. In very dilute urine the blood corpuscles swell up and speedily become only recognisable with difficulty, looking like pale spheres or circles; whilst if the urine be concentrated, they then shrink and assume a stellate or crenate appearance. In the former case colour is of no use, for that is speedily washed out of them, but when they shrink they tend to retain it for a longer period. They are then apt to be confounded with small crystals of

oxalate of lime (but good focussing soon makes that clear) and with the nuclei of renal epithelium, but these are brighter and more highly refractive, besides having no trace of colour.

When the kidneys are injured, as by a fall or blow, blood may be effused into their substance and yet make no sign, save the tubules be ruptured and the blood escapes by the ureters. Such extravasations are most frequent in the cortex. When blood escapes from the kidney in any amount, it is easily recognised, and the presence of casts consisting of blood, if any, in the urinary deposit, shows that it has come from the kidney. The deposit is dark or brownish red, and solidifies after standing. This coagulation sometimes takes place in the ureters or the bladder, and may occasion great inconvenience before the coagula are expelled. If coagulation in the ureters has taken place, small worm-like casts are passed, and the symptoms resemble somewhat those of renal colic. A good deal of blood may be passed in congestion of the kidney or acute Bright's disease, but here it does not coagulate in the urine after being passed, but only suffices to give it a dark smoky or porter-like tint. Coagulation may however, and does, take place in the kidney, whereby the tubules are plugged and kidney mischief set up, by more or less permanent blocking of the tubes. When only a little blood is passed in such cases, and the urine is dilute, it may not be very readily recognisable, but if there be any of the ordinary brownish sediment, a small quantity should be taken and boiled along with caustic potash. This precipitates the phosphates as tribasic phosphate of lime, and in falling this carries with it the colouring matter of the blood, and collects at the bottom of the test-tube as a bright-red sediment. Neither bile nor urinary colouring matter is so carried down, so that this, which is known as Heller's test, is a very good one for the presence of blood in urine. Of course bloody urine contains albumen and so coagulates with heat and nitric acid, being darkened by the latter just as it is rendered brighter by an alkali. Hæmorrhage arising from cancer or calculus will of course be accompanied by the other signs of these maladies. One peculiar form of renal hæmorrhage is due to the presence of a parasite in the kidney—the Bilharzia Hæmatobia. It is most frequently found in Egypt and Eastern Africa. This parasite occasions great ravages both in the kidneys and intestines.

It would of course be indicated by the passage of ova or young parasites with the bloody urine.

As hæmaturia is mainly symptomatic, its *treatment* must depend on its causation. In most cases nothing special requires to be done for the hæmorrhage. If it become dangerous in itself, ice should be applied over the kidneys and hæmostatics given internally; the best of these is acetate of lead and opium in the form of pill. Tannic, or better, gallic acid too is useful. Ergot, or ergotine, and turpentine should be used if these fail, as they are apt to do. The injection of cold water into the rectum has often a highly beneficial effect. Clots in the bladder must be broken down by the injection through a catheter of faintly alkaline solutions.

INTERMITTENT HÆMATINURIA.

It has been known for some time that under conditions imperfectly understood, especially in what were called "putrid fevers," the blood became altered—"dissolved," as it was called, and then quantities of dark blood, but without the appearance of any corpuscles, were passed in the urine. Such a condition could be artificially produced by the inhalation of arseniuretted hydrogen and the injection of certain matters into the blood. But besides this, a similar condition of the urine arises from time to time in certain individuals, and to this the name of intermittent or paroxysmal hæmatinuria has been given. In many respects the malady resembles the effects of malaria, and, like such forms of disease, is invariably ushered in by rigors and a sensation of cold, but differs from ague in this respect, that the cold is absolute; there is depression of temperature as indicated by the thermometer as well as by the patient's sensations, whilst in ague there is during the cold stage actual elevation of temperature. During this stage the patient is blue, sometimes almost black; the feeling of cold and the blueness are always most severe where the circulation is slowest—in the hands, feet, and point of the nose.

During this stage the patient's feelings are very miserable: the temper is altered; he sits as close to the fire as possible, and complains of a dull aching in the back and loins extending down the thighs. There is also sometimes pain or weakness in the lower limbs, and in some the testicles are retracted. During this period

too the patient feels sick, yawns, and may even vomit. The fit lasts a varying period, sometimes for two or three hours, sometimes longer. They never occur at night, or as long as the patient keeps his bed. Very often they begin as soon as the patient gets out of bed, last all the forenoon, and then pass away in their characteristic fashion. This is invariably with the passing of a quantity of dark porter-like urine, turbid and depositing on standing a copious chocolate-like sediment. Otherwise the urine is not unnatural: its specific gravity is fair (1020—1025), the reaction slightly acid, or faintly alkaline, but of course from the altered blood highly albuminous. Urea is rather in excess than otherwise. On examination the chocolate sediment is seen to be composed mainly of amorphous matter with stray red blood corpuscles not much altered, small bright crystals of oxalate of lime, apt to be mistaken for red corpuscles by the unwary, and dark granular casts of disintegrated blood. With the passage of this urine the symptoms for the time disappear; the temperature rises, the patient becomes more cheerful, though weak, and when next urine is passed it is natural in every respect—clear straw yellow, without a trace of albumen or blood stuff. As the paroxysm never occurs whilst the patient is warm in bed, the first urine passed in the morning is always of this character. The period of intermission varies, and sometimes it may be imperfect, for the whole of the altered blood may not be passed, but may circulate in the vessels and give the patient the appearance of jaundice. This jaundice has nothing whatever to do with the absorption of bile, but is entirely due to the circulation of altered blood colouring matter. It is important to note that when the cold stage passes away it is not followed by a hot one, the temperature only rising to the normal elevation. The periodicity varies: in some it is as perfect as in ague; in others most irregular. The first onset of the disease very often follows exposure to cold and wet, or to malaria, but an aguish history cannot be made out in all. Males are much more liable to it than females. The intermissions may be very long, so that what might be called a relapse may not occur for months. A relapse is, however, liable to occur on exposure to cold and wet. Many of the patients improve greatly under treatment, but suffer on the least cold. Hence the importance of a change to a warmer climate, which is one of the most important indications.

The *treatment* that does good corroborates the idea of a malarial origin; it consists in large doses (10 to 20 grains) of quinine, or if this gives headache, large doses of salicin. Warmth is all important; as long as the patient can keep his bed he is all right, but exposure to cold promptly brings on an attack. Iron should always be combined with the quinine; good food and a fair supply of stimulants are also necessary. If the malady persists, removal to a hot climate is the only thing that promises complete immunity from such attacks.

CHYLURIA.

The disorder to which the name of chyluria, from the milky or chylous appearance of the urine passed. is given, is for the most part a tropical malady, in particular being endemic in the East and West Indies, Eastern Africa, and the Mauritius, and in Brazil.

The cases seen in this country are almost invariably imported from one or other of these regions. The malady is most frequent in young people, and as we see it more commonly in males than females; but that is probably due to males being more frequent travellers than females. The health of those suffering from the malady varies—some are stout and hearty, but most weak and emaciated. The appetite too differs—sometimes it is enormous, sometimes deficient. The only real sign of the mischief is passing from time to time a urine more or less milky, and often containing blood. On standing, the urine coagulates of its own accord, but the coagulum is never very consistent, and tends to break up spontaneously. If it coagulates in the bladder it may give rise to great annoyance. When the urine has stood for some time a fatty matter like cream forms on its top, and this fat may be dissolved by ether, leaving the urine apparently healthy. This urine is also albuminous; its specific gravity less than normal. It contains no casts, but blood corpuscles, especially white ones, and fatty molecules are readily seen under the microscope. Sometimes no fat is present, so that though the urine coagulates and contains albumen, it is not milky. The coagulum in this case resembles jelly. Most frequently the mischief comes on quite suddenly, and it tends to recur at irregular periods, being most chylous or fatty after food, lymphous or jelly-like in the intervals.

The exact mode in which chyluria is produced is not quite clear, but the discovery of a parasite in the urine in some such cases, and in others in the blood, leads us to believe that these have something to do with its production. The parasite belongs to the nematoid group of worms, and is not unlike a trichina, but its history has not yet been perfectly made out. It seems to be allied to the Dracunculus or Guinea worm.

Under such circumstances we can hardly expect the *treatment* to be satisfactory. Iron does good, and gallic acid has been recommended. We must look for the best results from the destruction of the parasite by some means not yet discovered. In one case a decoction of mangrove bark seemed to cure the patient.

SUPPRESSION OF URINE.

Suppression of urine is one of the most serious accidents which can occur. It may be *essential*—that is to say, dependent on tissue change in the kidney or its appendages; or it may be merely *due to obstruction* and to consequent non-appearance of the usual flow. Essential suppression of urine occurs in the algide stage of cholera and in yellow fever, and in both the reappearance of the urine is always anxiously looked for. It occurs temporarily in some cases of acute Bright's disease from overcongestion; and again it occurs in the closing stage of the chronic forms. Many poisons, especially corrosive sublimate, give rise to suppression of urine; and still another group of cases seem to depend on purely nervous causes. Such are the cases which happen after forced catheterism, or Holt's stricture operation, or even where there is no great resistance to the passage of the catheter. Other forms of shock may similarly give rise to this kind of mischief. If speedy relief be not afforded, such cases soon terminate fatally. It is, however, the general condition which is most to be dreaded; the suppressed urine is only a sign of its danger and severity. The great remedy in such forms of suppression is the hot bath, as hot as it can be borne, in which the patient should be immersed up to the neck and kept there for some time. At the same time hot water should be thrown up the bowel, and if the patient can swallow he should have plenty of hot drink.

Complete obstruction to the flow of urine is much more

frequently met with. The most common mediate cause is impacted calculus, when the opposite kidney has somehow been rendered useless. Cancerous growths, too, may block up a ureter, and if these originate in the fundus of the bladder may readily involve the orifices of both. The history of such cases is in complete contrast to the preceding. Instead of death following with speed on the suppression—however complete this may be—death does not occur for a week or ten days. In most cases too, some little urine is passed from time to time. After the lapse of a week or ten days uræmic symptoms usually begin, and then the end is not far off. First, we have twitching of the muscles, contraction of the pupils, slow breathing and lowered temperature, dry tongue and mouth, and complete loss of appetite. Even up to the last intelligence may be unimpaired, but usually there is drowsiness, dulness of comprehension, and some delirium. Deep coma and convulsions are very rare. Dropsy never occurs, and the skin is usually moist—all markedly different from what occurs in Bright's disease, and in ordinary retention of urine. Sometimes recovery occurs, even after some days' complete obstruction, but it is very rare indeed, after signs of uræmia begin to show themselves.

The *treatment* must depend on our diagnosis of the cause of obstruction. Calculus is the most frequent cause, and that we must try to dislodge. When there are signs of renal colic we must persist in the use of opium, chloroform, and heat, but not in other cases. Mechanical means, especially shampooing, have been strongly recommended. Everything may be tried, for the case is sure to end fatally if we do not succeed in overcoming the obstacle.

POLYURIA.

Cases where there is a copious flow of dilute urine are sometimes denominated diabetes insipidus, but the term polyuria seems better adapted for general use. In most there is great thirst as well as copious secretion of urine, so that the term polydipsia has also been applied to the condition. It is more frequent in males than females, and is most common in middle life. Often no cause can be assigned for it, but sometimes we have a history of blows or injuries to the head, or cerebral disease, promptly followed by polyuria, leading us to suppose that the nervous system

was mainly concerned in its production. Experimental research leads to a similar conclusion. Often the malady comes on quite suddenly, the thirst being even more marked than the discharge of urine. When plenty of fluid is given, the urine and drink amount to about the same; but if the quantity of fluid be restricted more water is passed than swallowed, the tissues being deprived of some to make up the amount; hence, too, the skin is generally dry and rough, and the patient thin. In other cases the skin may be moist, and the bodily condition good. The appetite varies, but as a rule is good, sometimes voracious. The strength is diminished, and the mental state affected. Heat of skin is very troublesome and the bladder is often very irritable. Death generally results from some inter-current malady, particularly of the lungs. One of the most troublesome things to the patient is the frequent calls to make water and to drink, interfering sadly with his rest at night. The period during which the disease may last is too various to be worth anything in the way of prognosis.

All kinds of remedies have been tried—none promise much. Recently the continuous galvanic current has been made use of; this, if we allow that the malady is due to a nervous lesion, especially of the abdominal sympathetic, is perhaps that which is most likely to prove successful.

DISEASES OF THE NERVOUS SYSTEM.

DISEASES OF THE BRAIN AND APPENDAGES.

HYPERÆMIA AND CONGESTION OF THE BRAIN.

Congestion is the title given to an ill-understood condition of brain, which during life gives rise to very various symptoms, but of which after death there seems to be only one common indication—namely, over-fulness of the finer cerebral vessels. It comes on too in various ways, but for the most part, whether with or without antecedent increase of sensitiveness to external impressions, the mental powers soon become dulled. The patient requires an unusual stimulus to use his powers of perception, and the organs of sense are often at fault; first they are too sensitive, then they are too little so. He is sleepy, and his movements are slow and laboured. Headache is not so much complained of, as a rule, as a feeling of heaviness and discomfort. The head is hot, the veins full, the conjunctivæ congested, the pulse is usually slow, the bowels constipated, and the urine high-coloured. These, sooner or later, give place to other symptoms. The patient, when perhaps undergoing some exertion, suddenly loses consciousness, but only for a few moments, followed by confusion of thought and speech. At the time of the first attack he usually falls or slips down, but power of motion is soon restored, and before long he seems quite well again. But in one advanced in years, and to these such attacks are most common, there is great risk of recurrence, and each subsequent attack seems worse and worse. In younger patients the attack may assume the convulsive form. After feeling uncomfortable for a time, these patients fall down in a convulsion, epileptiform in

character; and when they recover from this there is much headache and confusion, with great muscular weakness. A third symptom of brain congestion is delirium, particularly in old people. This may be so great as to be taken for mania or melancholia. Very often such symptoms occur at night, and the patient does not know of their access, but the mental powers become weaker and weaker as the bodily strength gets less and less. In early life, again, fever may be a marked symptom, and the malady may resemble meningitis; the head is hot and the feet cold, and there is delirium, but no other signs of organic disease. This condition either passes speedily away; or the patient tends to become comatose, with or without convulsions; in the latter case there is entire loss of voluntary power, even the sphincters relax, the breath and pulse are labouring, and the patient sinks to death. In patients who have been accustomed to much mental work, we may have cerebral congestion with no appearance of flushing of face, but rather pallor and great sleeplessness; such symptoms are apt to be misunderstood.

From what has already been said, it will be understood that cerebral congestion may arise from various causes, both in the old and young. Briefly it may be said that there are two forms. (1.) Where too much blood is sent to the brain (hyperæmia), and this may be due either to general vascular distension, or to some cause acting locally. (2.) When too little blood leaves the brain (congestion), as occurs from general or local causes of venous obstruction. In any case, if regularly over-filled, the vessels of the brain tend to become varicose and devious in their course, rendering them particularly liable to give way under any unusual stress. This is especially the case in people advanced in life, or in such as exhibit a bodily condition similar to that produced by advancing years, as chronic alcoholism. In these, therefore, the malady is likely to be more dangerous than in younger subjects. After death only minute injection of the vessels can be made out.

Treatment.—In congestion, or rather hyperæmia of the brain, bleeding is still the orthodox plan of treatment; but it is so only in those cases which come under the first heading, where too much blood is sent to the head. Congestion may be a sign of weakness, and then bleeding, whether from a vein or by leeches, is forbidden. In these, ice to the head, purgative enemata of salt-and-water, or soap-and-water, and hot foot-baths with cold

douches to the head, constitute the proper practice. In a good many cases withdrawing blood by leeches applied to the back of the ears, or by cupping the back of the neck, is quite sufficient to relieve symptoms. If the stomach is full, especially if the symptoms have come on after a full meal, an emetic should be ordered (pulv. ipecac. gr. x, zinci sulphatis gr x. M.) Mustard is also an excellent emetic in such cases. In less acute cases saline diuretics do good. In all cases the head should be kept well up, night and day, sudden changes of position should be avoided, and rest and quiet made absolute.

ANÆMIA OF THE BRAIN.

The importance of cerebral anæmia depends mainly on those researches which point to it as the most potent cause of convulsions. Cerebral anæmia may be only a part of general anæmia, or it may be restricted to the brain alone. The general anæmia may depend on loss of blood, or of fluid derived therefrom, by persistent diarrhœa in children, by fevers, and even by want of food. One very characteristic form of cerebral anæmia is that seen in a patient greatly weakened by loss of blood, as a parturient woman, who tries to sit up, or rise from bed. Again, we may have the same thing brought about artificially by compressing the carotids, or by tying one of them. It is, indeed, held by some, that the symptoms of compression within the skull are really due to cerebral anæmia. The space occupied by the compressing body—blood, bone, or fluid—is so much cranial space no longer available for blood-supply, and as the blood-supply and cerebral fluid are the only variable quantities within the skull, one or both must be diminished, that is to say, cerebral anæmia must result. Practically, too, anæmia—that is, deficiency of aërated blood—would follow from any cause which interfered with the circulation through the cerebral capillaries, and limited the blood change to the larger vessels.

The mode of production has some influence on the manifestations of the signs of cerebral anæmia. If sudden in onset, everything becomes dark and the patient feels dizzy; promptly insensibility and complete loss of movement follow, the breathing is slow and gasping, and the pupils are dilated. There may be slight spasm of some of the muscles, particularly of the face. This is the history of a fainting fit from loss of blood, and it is also the history of the mode in which

death very often occurs, for the fainting may become permanent, and no recovery follow. When anæmia comes on more slowly, the patient complains of headache, noise in the ears, giddiness, and flashes of light. Such might be easily mistaken for signs of hyperæmia; but if they occur, as they often do, in women who have been subject to hæmorrhage, such a mistake should not be made, especially with the pallid appearance they present. In children the condition gives rise to what is sometimes called hydrencephaloid disease, and which, being mistaken for meningitis, has sent many an infant to the grave. The clue is given by the child's history and appearance: it is weak and debilitated from some cause, perhaps diarrhœa. In the early stage of this condition children are restless and irritable, they sleep badly, and otherwise show signs of lurking brain mischief. Later, they cannot be roused, the pupils no longer respond to light, the pulse is slow, and they die comatose.

Treatment.—Nourishment is the great thing in most cases of cerebral anæmia, and in general anæmia from loss of blood. Stimulants must be freely used, and the patient kept absolutely at rest, flat down on the bed; no movement whatever should be allowed. In puerperal women transfusion may be necessary. In infants, arresting any diarrhœa and improving the food is the most important measure; for food raw pulped meat is best; a hard-boiled egg, chopped fine, will also be found very useful in such cases. Signs of general and cerebral anæmia, with muscular twitching approaching to spasm, are signs of great danger, and demand prompt relief. Rest flat on the back or face, food, and stimulants—sherry, port, or brandy—are the remedies—not ice, purgatives, and bleeding. Above all, the patient must be kept still; many patients have lost their lives by insisting on rising to go to stool. It is far better that a draw-sheet, or some similar means, however repugnant to the feelings of the patient, should be used, than that risks of this kind should be run.

MENINGITIS.

MENINGITIS SIMPLEX.

By meningitis is meant inflammation of the membranes covering the brain and spinal cord, especially of the pia mater and arachnoid. Spinal meningitis is usually

described separately, as the symptoms differ greatly from those of the affection of the cerebral membranes. Simple meningitis, affecting the convexity of the brain, is more frequent among adults than among children, among whom the tuberculous and basilar form of the affection is most frequent, particularly between the ages of one and fifteen. Among adults the rheumatic form of the affection, or that which follows or accompanies exhausting illness, as Bright's disease, is not uncommon; but the most frequent cause of the malady seems to be injuries to the head. It is common to describe two or three stages of the disease. The first is generally spoken of as one of excitement, briefly characterized by shivering, or in children convulsions, followed by fever, contraction of the pupils, extreme headache and intolerance of light and sound, vomiting, and constipation, with fierce delirium and sleeplessness. The second stage is totally different: here is depression more or less complete, the delirium is quieter, and there is a tendency to coma, though there may be convulsions and rigidity of the back of the neck (these may even usher in the attack); the pupils dilate, and vision is partially or wholly lost, the breathing becomes stertorous, and the whole body seems paralysed, except for muscular twitchings. The pulse, from 120 or more, falls to 60 or 70, or less; it is slow and irregular, and there are almost invariably convulsions. In the third stage (a mere continuation of the second) there is complete prostration and insensibility: the sphincters relax, the face is shrunken, and the surface cold; there is absolute coma and paralysis.

The site of this form of inflammation is the convexity of the hemispheres. The vessels of the pia mater are there injected, and the sub-arachnoid space, especially in the sulci filled with thick, purulent matter. The cortex of the brain is soft, and the ventricles are empty, whilst in the basilar form of meningitis they are always full. Cerebral rheumatism, as it is called, is a complication of rheumatic fever not very frequently seen. Undoubtedly many cases so described have been cases of what we now term hyperpyrexia.

TUBERCULAR MENINGITIS.

Tubercular meningitis, or acute hydrocephalus, is the form of the malady most frequently seen in children.

It affects the base, not the convexity of the brain. It is commonly preceded by loss of flesh, not so much affecting the face as the body. The child is drowsy, but does not sleep well, particularly at night. He is easily tired, and often rests from play, leaning his head on his hand. At night he dreams and starts in his sleep, cries out, and grinds his teeth, whilst in temper he is fretful and peevish, desiring nothing better than to be let alone. Headache is usually complained of, especially after exertion of any kind, but it is not severe, and mostly affects the forehead. At the same time there is a rise of temperature, especially at night, but these symptoms may be masked by some antecedent disease, as measles or hooping-cough. When the disease has fairly set in, the symptoms become more marked, and some are superadded. Vomiting is almost invariable. Convulsions are frequent, but much less so than vomiting; whilst the bowels are almost always confined, and the belly sunken.

The characters of well-marked tubercular meningitis differ from those of the simple form of the disease chiefly in this—that whereas the former affects the base of the brain, the latter most frequently implicates the convex surface of the hemispheres. In tubercular meningitis the pulse at first is slower than natural, afterwards increasing in frequency, but it is always easily excited by exertion. Another notable peculiarity is irregularity of pulse, and this is most commonly found when the disease is well marked. The surface is generally pale, but easily flushed. The breathing, too, is irregular: the child remains for some moments without breathing, then draws several inspirations rapidly following one another. With alteration of circulation and respiration there is increased bodily heat, but sometimes there is lowering rather than elevation of temperature, especially in the advanced stages of the disease. The eyes generally yield important indications: the pupils, at first contracted and readily irritated by light, are found later to differ in size, one being large, the other small; finally, they no longer respond to light. Dilatation is the rule, and squinting is almost invariable. Examined by the ophthalmoscope the optic discs are seen to be woolly and somewhat convex at their edges. Convulsions invariably occur as the disease advances, whilst muscular rigidity is also often present; the convulsions may only amount to muscular twitchings, or they may be universal. In some cases there is paralysis more

or less general, and there is also a tendency to coma, more or less marked, but up to a late period the child can be roused. Sinking of the belly is a symptom of some importance, but that, too, gives way in the end to distension.

There is no one thing the practitioner needs more to bear in mind than the tendency to remit in this disease. He pays his usual visit, and finds the child apparently much better; the parents are hopeful, and if unguarded he may make a rash prognosis of good. But this improvement is only temporary: the child speedily falls back, and becomes worse than ever. Death usually ensues in from fourteen to twenty-one days from the onset of the marked systems. Meningitis may occur as one of the results of general tuberculosis. Then the first indications of evil may be stiff neck, wide pupils, slow pulse, and coma.

On examining the head after death, the arachnoid is found dry and sticky. The pia mater is highly vascular, its capillaries minutely injected; semi-opaque or lymph-like fluid containing few pus corpuscles is found, especially between the convolutions, around the optic commissure, the cerebral peduncles, and the pons extending in front upwards by the fissure of Sylvius. Tubercles are most frequent around the middle cerebral artery, and other vessels at the base of the brain; these may be in parts yellow. The membranes adhere to the brain substance at points, and the convolutions are somewhat flattened. The lateral ventricles are distended with fluid, serous or purulent, their walls and the fornix are soft and almost diffluent; and their lining membrane covered with tubercles; often the substance of the brain is softened. Tubercular deposits are always found in other parts of the body. This condition is sometimes spoken of as acute hydrocephalus, but the name is not a good one.

Treatment is, unfortunately, save in the very earliest stage, useless. Then the great thing is absolute rest and quiet in a darkened room; the food should be simple and easy of digestion, and the bowels regularly kept open without undue purging. Cold should be applied to the head, either by cold water cloths frequently renewed (if not they act as poultices, quite the reverse of what is intended) or kept wet by a drip from a vessel suspended over the head with a piece of lamp cotton hanging over its edge, or by ice-bags tied under the chin. In some cases blisters to the back of the head or behind the ears are of

undoubted service, but they should not be permitted to remain on too long. If convalescence is attained, or in sub-acute cases, the syrup of the iodide of iron and cod-liver oil, with or without iodide of potassium, are of the greatest value. If the disease has gone beyond a certain stage, treatment is useless; symptoms must be dealt with as they arise. In the very early stage, especially in the adult and where there is no tubercular history, bleeding by leeches behind the ears is a good commencement to treatment.

CHRONIC HYDROCEPHALUS.

Chronic hydrocephalus, or dropsy of the brain, has its site in the sac of the arachnoid or in the ventricles. It may be congenital, but is usually developed after birth, sometimes even late in life. Probably in some instances it is compensatory for cerebral wasting. In many cases, however, the head is very greatly enlarged, and the brain altered. If the accumulation be ventricular, then the surface of the brain corresponding with the bones of the head is flattened, its interior hollowed out; when in the arachnoid, the brain is flattened and diminished in size from above downwards. The bones of the head are thin and transparent, and their sutures badly united. The appetites of such children are often voracious, but they do not thrive—rather, they waste. The forehead becomes protuberant, whilst the head seems to increase out of all proportion to the face. Fluctuation is felt over the fontanelles, and the veins of the head are distended. There is loss of sight, and later paralysis, ending, it may be, in convulsions. Laryngismus stridulus is common. Death may result from exhaustion, or some intercurrent mischief. Syrup of the iodide of iron with cod-liver oil is the most important remedy in this condition. Mercurial inunction was formerly much employed. Counter-irritation, to a slight extent, does good. Tapping by aspiration might do good—the old plan of tapping did not succeed.

ENCEPHALITIS.

The term encephalitis is generally given to inflammation of the brain and its membranes, for though we can

fairly well separate meningitis, especially of the tubercular kind, from other intra-cranial maladies, inflammation of the brain substance (cerebritis) is nearly always accompanied by a similar affection of the meninges.

Encephalitis is usually the result of direct injury to the head, as by falls or blows, and this too with no injury to the bone itself, and often only occurring some time after the injury, as if due to the irritation of some slight hæmorrhage. It may also be due to the spread of inflammation from other parts, especially the inner ear, or to caries of the petrous portion of the temporal bone. But still other causes may set the disease in motion, as arrest of the menstrual flow. Usually it begins with some degree of local irritation prior to the onset of marked symptoms, which are dull, deep-seated headache, giddiness, and vomiting, but not much fever. There is no paralysis in the strict sense, but only marked weakness and lassitude. The mind, moreover, dies out gradually, becoming more and more dull and confused. Convulsions and coma almost invariably occur. Often the patient in a chronic case seems about to mend, but only to fall back again, until the invariably fatal termination occurs.

Softening of the brain substance occurs in more or less isolated spots. These consist of a reddish or greyish pulp made up of the débris of nerve-cells, nerve-fibres, neuroglia, and blood-corpuscles.

The *treatment* of encephalitis, if the disease be at all marked, may be anything or nothing. The cases almost invariably end fatally, and are seldom recognised till pretty well advanced; but much may be done to relieve pain by the local application of cold, and if the sickness be troublesome a little ice swallowed slowly will generally do good. Blisters sometimes help to relieve pain, especially if morphia be sprinkled on the raw surface when the cuticle has been removed. Not more than half a grain should be so administered.

ABSCESS OF THE BRAIN.

Abscess of the brain is not easily distinguished from chronic softening in many cases. It is usually the result of traumatic inflammation, and for this to be set up no fracture of the skull is necessary—mere concussion some-

times seems to be enough, and that too some time after the receipt of the injury, the first signs of which may long have passed away before any distinguishing marks of brain disease appear. Another very common cause of cerebral abscess is caries of the temporal bone following old standing disease of the ear, especially if, from any cause, the wonted discharge has been stopped. Another class of abscess of the brain is the pyæmic abscess.

The most frequent symptom of abscess is pain in the head. This is often very severe, though sometimes absent, and may be felt just over the abscess, but also in more remote situations. It may be paroxysmal. Instead of pain, an epileptiform seizure may be the first sign of the disease, and such convulsions may be the most prominent symptoms throughout. Numbness and tingling again may be the first indications of evil. In most cases we sooner or later encounter paralysis, usually hemiplegia, but varying with the site of the lesion, as in other cerebral maladies. Rigors also may occur early in the complaint, so that it has some of the aspects of an ordinary fever.

The tendency of cerebral abscess is to death, but if the patient be kept quiet, it may remain dormant for years. After death the abscess is most frequently found in the middle cerebral lobes, and in the white substance of the brain. If recent, the tissues round it are softened and œdematous, and its walls soft and ragged. In old standing cases the walls of the cavity are lined by a connective tissue membrane of greater or less thickness. In recent cases too the pus is generally green, but not always fœtid; in old abscesses it has undergone change, being green or blackish, foul-smelling, and containing no pus-corpuscles. If the abscess be large, the shape of the brain surface may be altered and bulging. Instead of making their way to the surface cerebral abscesses may open into the ventricles. Pyæmic abscesses are generally multiple. The spread of inflammation from the inner ear to the brain usually leaves unmistakable marks on the bone, dura mater, and brain itself, but this is not invariably the case, and the surface membranes of the brain may be quite healthy.

Abscess of the brain and intra-cranial tumours have many symptoms in common, and it is not always possible to make a diagnosis. The symptoms in both cases depend on the locality affected, but, roughly, it may be said that

pressure symptoms are much more common with tumour than abscess.

Cerebral abscess is too frequently a fatal malady to enable us to say much as regards *treatment*. Even opening the abscess when fairly diagnosed does not promise particularly well. Rest and quiet and the relief of pain are the great indications. Absolute quiet therefore should be insisted on after injuries to the head, especially if localized pain persists. If, on the other hand, there is disease of the inner ear, especially of the mastoid cells, a free exit for the pus seems the first essential; removal of any dead bone is also important, if practicable. The diet should be as simple and unstimulating as possible.

PLUGGING OF VESSELS—SOFTENING OF THE BRAIN.

Softening of the brain of the non-inflammatory kind is characterized during life by gradually diminishing mental power, with loss of general sensation and power of motion. These are most frequently encountered in the aged, or in those in whom premature decay and rigid vessels have been brought about by some means or other, and in whom arrest of the blood flow in the smaller vessels is most easily effected. The malady may come on gradually, with symptoms somewhat similar to those of congestion; but the regular manifestations of the disease may suddenly become marked.

When, on the other hand, a large vessel suddenly becomes obstructed, the patient may have a stroke, as it is called—that is, become suddenly and partially paralysed. The patient is nearly but not quite insensible, for he can be made to respond to a stimulus, such even as speaking loudly and sharply. In this state he lies for a varying length of time; he can be roused, but is altogether unintelligent and unintelligible, and he gradually passes into a state which might well be described as that of death in life. There may be temporary recovery, but it is merely temporary, and soon gives way to a renewed accession of the malady. This acute form may either terminate speedily in death or pass into the chronic stage of the malady.

Sensation may be completely lost at the time the plugging occurs, but may return, though imperfectly, or is altogether lost. Loss of localizing power, and a painful or contracted condition of certain of the

paralysed parts are common. Often the head and eyes are turned to one side, sight is lost in some cases, and the features are drawn to one side; but the forehead and eyelids are as a rule unaffected. The power of speech is commonly impaired, and may be lost, and this may be so both intellectually and mechanically. To the former condition, where the power of language is lost, the term *aphasia* has been applied. The patient has ideas, but cannot express them in words. He may endeavour to make the same word pronounced in different tones suffice, but even these tones do not always signify the same thing. A patient we well remember made use of the word "George" in this way. This one word or sentence he can pronounce perfectly, but there is complete failure when the patient tries to go beyond it. Neither can he write; he may be able to construct letters and build them into groups, but the groups are without significance quite as much as if the letters were dropped from a pepper-caster. It must not be forgotten that most aphasic patients are right hemiplegics, so that they have lost the power of using the pen or pencil with the right hand.

In a condition which simulates this the patient lacks the power of conveying his ideas of words to the point where they are converted into motor acts. The intellectual centres may be unimpaired and the motor organs may be so likewise, but between the two is a diseased hiatus which cannot be bridged over. Roughly it may be said that the former condition corresponds most frequently with disease of the posterior and inferior left frontal convolution of the cerebrum, or of the island of Reil; the latter to disease of some part of the corpora striata on one or both sides.

Paralysis of one or both sides is the rule in softening of the brain, and there is a tendency to rigidity or spasm of the paralysed limbs. This spasmodic variety of the disease may be so strongly marked as to resemble when first manifested an epileptic fit. These spasms succeed each other with no comatose interval, and with increasing rapidity, until paralysis of one side becomes strongly marked and the ordinary form of the malady supervenes. Frequently, however, such patients die speedily. Occasionally delirium is the first symptom after the decided onset of the disease. If not speedily fatal, the malady assumes a chronic form, with diminution of sensation, or painful sensations advancing paralysis and loss of mental power, the patient gradually becoming more and more helpless.

As already said, softening may be inflammatory or non-inflammatory. Most are agreed that the latter (a form of necrosis) constitutes the great bulk of the cases seen. Moreover, it is admitted that this softening is mainly due to impairment of nutrition most commonly dependent on interference with the blood-vessels. These become blocked by emboli or thrombi, or their tissues altered so as to interfere with the normal exchange which should go on between the blood in the vessels, and the fluids of the organ supplied by them. Emboli are most frequently derived from vegetations on the valves of the heart, in a solid or broken-down state. Thrombi are of course formed on the spot. Any rigidity of the vessels would favour thrombosis. By impaired nutrition softening of the organ is brought about, and if rupture of the weakened vessel follows, the coloration of what is commonly called "red softening" would result from the effused blood. If of long standing, this colour would tend to become "yellow," another variety of softening spoken of. If there is no rupture of vessels and no hæmatin diffused, the softening is white.

Treatment of this, as of most cerebral maladies, is unsatisfactory. We have lost faith in mercury and bleeding, and no new doctrine has taken their place. Prevention is better than cure; hence rest and quiet with fairly good nourishment should be bestowed on any patients who show the premonitory signs alluded to. Symptoms must be treated as they arise; when softening has fairly begun, we can only trust to nature.

CEREBRAL HÆMORRHAGE.

In older nosologies an important place was assigned to what was called *apoplexy*. By this was meant sudden loss of consciousness, together with the powers of sensation and motion, due to some cerebral lesion. The most frequent lesion undoubtedly was rupture of a blood-vessel, and consequent injury to the substance of the brain from effusion of blood. We have, however, seen that cerebral congestion and cerebral softening of the acute kind may both simulate this state, and so, though we cannot discard the word apoplexy, still it is desirable to limit or define it exactly; if therefore it is to be used at all, it should be used only to indicate such symptoms as the above when they arise from hæmorrhage. Speaking of cerebral hæmor-

rhage, we must insist on the importance of being able to recognise its two factors—loss of blood and injury to the brain substance, since the symptoms may be a mixture of those due to the two causes, the latter, as a rule, predominating.

Cerebral hæmorrhage is essentially a disease of degenerating manhood. It rarely occurs before the arteries of the brain begin to change from old age, except they are already prematurely decayed from other causes—as Bright's disease, or alcoholism. In patients, therefore, under forty, who die from apoplexy, it is usual to find a large left heart, small hard kidneys, and altered blood-vessels. In more advanced life, too, it is common to find the vessels altered; their coats are thickened, but not stronger; they are less resilient; they act more like rigid tubes, and when there is any extra pressure they tend to give way, either permanently dilating, or forming minute aneurisms, or rupturing altogether. The vessels thus become less capable of resisting any unusual strain, such as may be produced by the over-fulness of the vessels following a large meal, mental emotion, or excitement. Sometimes the walls of the vessel itself give way, whilst the lymphatic sheath (perivascular canal of His) remains entire, so that blood is effused within the sheath, producing what has been called a dissecting aneurism; but the exact nature of which is as above stated. The exact influence of fatty degeneration of vessels, and of softening of the brain substance with the consequent want of support to the vessels, on apoplexy, is not clear; some attribute important bearings to these, others reckon them of little importance. But, besides the changes in the vessels themselves, there are altered conditions outside them to be considered. One of them, as assigned by some observers, is brain atrophy. As a result of this atrophy of brain substance, and to fill up the cranial cavity, which does not vary in size, there is increase of the cerebro-spinal fluid, and over-dilatation of the vessels; if these last be weak, they are likely to give way. Increased blood-pressure, from whatever cause, seems, however, the main element in producing rupture of diseased vessels. This increase in tension may be merely temporary, as after a meal, or be induced by violent mental emotion; or it may be permanent, as in hypertrophied left heart. In any case, sudden increase of blood-pressure is fraught with danger to a patient who has degenerated vessels.

Fatty degeneration of vessels is, by some, looked upon

as a consequence of brain softening, rather than its cause; if so, the fatty degeneration and the softening can hardly be looked upon as immediate agents in the production of cerebral hæmorrhage, except as diminishing the resisting power of the vessels. Rupture of a large aneurism may give rise to cerebral hæmorrhage on the large scale, whilst rupture of the small aneurisms, already spoken of as dissecting and miliary aneurisms, may give rise to it in a small, irregular, punctiform fashion. If these small hæmorrhages be numerous and close together, softening follows; and from the blood-colouring matter present we have red softening. In this way apoplexy and cerebral softening are brought into close proximity.

Blood effusion, on the large scale, ends in the formation of a clot, except in the purpuric or scorbutic conditions. These clots are of all sizes, from the miliary size already spoken of, to that of half the cerebrum. With small clots the tissues are rather pushed on one side than ruptured; but with the larger, the brain tissues are broken down, and hence there is at once greater primary destruction, and less room for repair than in the former instance. A large clot may open both into the ventricles and into the arachnoid cavity, but most frequently only into one of these, and often into neither. On the whole, the ventricles are more frequently invaded than the outer surface of the brain, as the chief seats of cerebral hæmorrhages are the great basic ganglia—viz., the corpora striata, and the optic thalami. Bloody effusions into these organs are almost always on one side only. Hæmorrhage into other parts of the brain is comparatively rare. Sometimes we find it in the grey matter or substance of the cerebrum, perhaps more frequently in the cerebral peduncles and pons; but it is rare in the cerebellum and medulla. The brain, if the extravasation has been large, seems anæmic on the side of the hæmorrhage, and the convolutions are flattened; but only if death has occurred very soon after the bleeding, for in no long time changes in the clot begin. Originally, of course, the clot has consisted of blood—solid, fluid, or both—mixed with broken-down brain matter, cells, fibres, and neuroglia; but as occurs elsewhere, changes of which we may take a black eye as the type, speedily occur in the effused blood. In the first place, serum and clot separate, and the serum infiltrates the surrounding tissues. Hence œdema and softening follow in the wake of hæmorrhage; at the same time, the altered hæmo-globin diffuses with the serum round about the clot, and so

red or yellow softening is frequently associated with hæmorrhage. But all this may be only temporary; the softening may be remedied by absorption, if the tissues have not been destroyed by deficient blood-supply, due to compression; the clot may undergo the same changes as elsewhere, from blood-colour to yellow: whilst the fine connective tissue (neuroglia) of the part surrounding the clot forms an enclosing layer or cyst for what remains. In this way the injury may heal, leaving only the cyst with coloured contents, or it may be coloured walls only, or even a streak of pigmented connective tissue, as its sole remains. In such old clots crystals of hæmatoidin, very similar to, if not identical with, bilirubrin (the red colouring matter of bile) are formed.

The grand symptoms of apoplexy from cerebral hæmorrhage, we have already said, are *loss of consciousness and the power of motion and sensation*, the latter being pretty well implied by the former; but further, there are certain special symptoms dependent on the localization of the lesion.

This loss of consciousness may be due, in a few instances, to syncope, from the mere loss of blood; but this must be rarely the case. In most cases it is owing to rupture of nerve fibrils and pressure on nerve cells, though some hold it to be due to sudden cerebral anæmia dependent on pressure sufficient to obstruct the capillary flow. Undoubtedly the suddenness of the lesion has something to do with this unconsciousness, for we may find complete loss of consciousness with a small clot, and persistence of general consciousness with a large one, if slowly formed. With this loss of consciousness there are usually associated dilatation of the pupils and stertorous breathing; but in the earliest stage the pupils may be contracted. The stertorous breathing only shows a severe attack, and that the palate is paralysed, and vibrating with respiration. These, after a time, give place to other symptoms, when what is called the stage of *reaction* sets in; now the breathing is quickened, though still stertorous; the pulse is quick, and the temperature becomes elevated. But this stage is subject to great variation in intensity and regularity. Often it never occurs, but the signs of pressure gradually extend from the cerebrum to the medulla, and the patient dies.

Paralysis, that is, loss of motion and sensation, more or less complete, is the most marked phenomenon following cerebral hæmorrhage when the immediate symptoms of

the attack have passed away; and the varying form of the paralysis we use for the purpose of localizing the site of the lesion.

Throughout the body, with few exceptions, decussation of nerve fibres is the rule. Hence it may be broadly said that the right half of the brain rules the left half of the body, and *vice versâ*. This is most markedly the case with nerves which issue from the spinal cord below the great decussation, but is also partly true of cerebral nerves. If parts be injured where the decussation is indistinct or doubtful, both sides will be paralysed to a greater or less extent. When there is no true decussation then the injury and paralysis will be on the same side; in the majority of cases they are on the opposite side.

Hæmorrhages into the hemispheres do not necessarily give rise to paralysis; but may give rise to unconsciousness, &c., for the time being. If the hæmorrhage be large, and the wall of the ventricle be ruptured, there is usually a convulsion followed by a deep coma. Such cases usually end fatally. Not so simple clots of the cerebrum; from such patients often recover, but with impaired mental powers, especially of memory, though this may be due quite as much to the softening and vascular changes which led to the hæmorrhage as to the clot itself. If large enough to compress or rupture the thalami or corpora striata, they give rise to hemiplegia. Lesions of the corpora striata, as already explained, involve the voluntary motor powers of the opposite half of the body. This arises from the fact that these ganglia are, as it were, condensers of thought into action. They interrupt the course of nerve-currents between the hemispheres, which are the sites of thought and mental energy, and the nerves which execute the will there formed. Thus the patient has the power of willing, but not the power of executing this will on one side. But nerves of motion which have their subsidiary or chief nuclei lower down the motor track, do not suffer. Such are the nerves belonging to the sympathetic system, especially those ruling the heart and lungs. The actions of these organs may be modified, but not arrested.

In injury therefore of the corpus striatum there is paralysis of the opposite side, especially of the upper and lower extremities and of the face. The arm always suffers more than the leg. The face is drawn over to the sound side, and the paralysed side of the face hangs loose and flaccid. The eyes and head may be turned to the sound side of the body, but the axes of both eyes are

parallel, *i.e.*, there is no squint. The tongue when protruded turns to the paralysed side. All parts of the face are not paralysed to the same degree; the patient can close the eyes, as in taking aim with a rifle, though not so tightly on the palsied side; he can chew, for the fifth nerve is not interfered with; he can put out his tongue, but the sound side acts more than the other—hence it turns to that side which is paralysed, nevertheless he may be able to use it for the complicated motions of speech as long as there is no affection of the ninth pair of nerves.

In most instances the optic thalami are injured as well as the corpora striata, either directly or by compression of its vessels. If so, then to the foregoing symptoms will be added loss of sensation. But this is not usually so deeply or persistently affected as motion—at all events, it seems to recover much more quickly.

The cerebral peduncles include both sensory and motor fibres, the anterior and inferior layers being mainly motor, the posterior and superior mainly sensory. Hæmorrhage therefore into these will vary in its effects according as sensory or motor fibres are mainly affected. The opposite side of the body is still affected, but if the injury be near the apparent origin or place of issue of the third nerve, we may have paralysis of the body on the opposite side, and of motor power in the eye, with ptosis and dilated pupil, on the same side as the lesion. This is *cross paralysis*. Such may, however, result from a twofold lesion, one affecting the nerve-trunk, the other the brain substance. The latter kind of lesions are mostly syphilitic.

In the pons we have all kinds of decussating fibres, so that a hæmorrhage into its substance may give rise to right or left-sided paralysis, or even paralysis of both sides. At the same time there is often paralysis of the facial on one or other or both sides according to the site of the hæmorrhage. Paralysis of the fifth is also produced, so that not only is there loss of motion in the face, but also loss of sensation in it, and of the power of chewing. The sixth nerve issuing from a common nucleus with the facial is often affected at the same time with it, so that facial paralysis and squint are often associated. With a large hæmorrhage into the pons affecting both sides, the pupils are contracted as in opium-poisoning, and death is speedy.

Hæmorrhages into the cerebellum and medulla are comparatively rare. They give rise to paralysis of various parts, but their exact symptoms hardly admit of definition. The

great majority of hæmorrhages take place into the cerebrum, especially at its base.

Treatment.—Any tendency to apoplexy should be as far as possible guarded against; any sudden tension of the cerebral vessels being sedulously avoided. When hæmorrhage has taken place, we must try to keep the quantity effused as small as possible, and try to get what blood has been extravasated reabsorbed. For the former, bleeding used to be the chief remedy; now it has fallen into disuse. In appropriate cases it may do good, just as in others it may do harm. Judgment is wanted to discriminate, and such judgment can only be gained by experience. If there are any signs of failure of the circulation, bleeding can hardly fail to do mischief. In fact, stimulants may be necessary. Under any circumstances rest is of the utmost importance, and so the patient should be kept quiet, with his head slightly raised, until he begins to recover. Many make it a routine practice to give croton oil, in doses of one or two drops placed on the back of the tongue, either by itself, or in syrup; but routine practice of any kind is objectionable.

When the patient begins to recover consciousness, we must avoid anything likely to bring on extensive inflammation. Hence coolness, darkness, rest, and quiet, bland nourishment, and open bowels should all be attended to. Ice should be kept to the head, and when the more acute symptoms have passed away, a blister should be applied for a few hours to the back of the neck, and the part covered with a poultice; deep blistering is not admissible, but light blistering may be repeated again and again. The palsied muscles may be excited by electricity and thus kept fairly nourished and ready for use when called upon. Care in diet is essential, and as one attack may be said to predispose to another, every precaution should be taken to prevent a recurrence which might end fatally.

HÆMORRHAGE INTO THE MENINGES.

Meningeal hæmorrhage is mainly the consequence of a cerebral clot making its way to the surface, or is of traumatic origin. A peculiar form, called hæmatoma of the dura mater, seems to be the result of an inflammation and subsequent rupture of the capillaries in the inflammatory products. Hæmorrhage into the meninges may occur either

in the sub-arachnoid space or in the folds of the membranes. The surfaces of the hemispheres, the tentorium, and the base of the brain are the most common sites of such bleeding. These hæmorrhages having nothing to restrain them, are often very free, and their symptoms severe or even speedily fatal. There are no signs of localization, and the diagnosis may be said to depend on the want of these.

INTRA-CRANIAL TUMOURS.

In dealing with tumours within the cranium, one or two facts must always be borne in mind:—

1st. That as the central nervous substance controls sensation and motion in all parts of the body, lesions affecting it will have both a local and a general manifestation; a local, specially depending on the nature of the disease; a general, depending mainly on its site.

2nd. As these general manifestations, which usually take the form of paralysis, tend to assume the greater apparent importance, the site of the lesion may sometimes be said to be of greater importance than its kind.

3rd. Hence it is that diseases of the most diverse kind may be manifested externally by signs which seem to be very similar. Thus for certain purposes we may group together tubercle, syphilis, malignant disease, simple new growths, blood-clots, aneurisms, cysts, hydatids, &c. New growths tend more to affect nerve tracts than do the other cerebral maladies. In paralysis too depending on lesion of the substance of the nerves the muscles do not respond to electricity, whilst they do in central paralysis.

4th. The site of a lesion, though sometimes not easily defined, may often be so with extreme exactitude. Yet it is quite possible for a tumour to exist within the skull and there be no reliable signs to indicate its existence.

The intellectual powers are in some cases of intra-cranial tumour altogether unimpaired; in others there is some alteration of temper, generally tending to irritability, or there may be loss of memory and dulness of intelligence, ending with coma and convulsions. Headache is one of the most constant symptoms, varying greatly in intensity, most times severe and fairly localized, though not necessarily over the seat of the disease. This pain is more or less constant, but readily aggravated by emotional or

mental disturbance, sudden exposure to light or sound, or abrupt movement. Notwithstanding this effect of light and sound, both sight and hearing are often impaired and marks of congestion are to be found by the ophthalmoscope in the retina and optic disc, especially if the tumour is in the anterior portion of the cranial cavity. Giddiness is often distressing; the motion being referred to the patient's own body—*i.e.*, as if he were rolling; and not to surrounding objects, which do not appear to revolve. Convulsions are frequent signs of tumour, especially just before death, but in certain forms they occur from an early period. Such convulsions are not, however, followed by the comatose condition of epilepsy, and consciousness is only partially lost during the attack. They are most common when the tumour affects the back part of the brain, or the cerebellum. One of the most frequent effects of cerebral tumour is paralysis about the face. Very often the muscles of the eyeball are thus affected, especially when the tumour is the result of syphilis. Loss of speech too is common, but less so than of the perfect motor powers of the eyeball. Hemiplegia—that is, loss of the power of one side of the body, is frequent. Paraplegia—that is, loss of power over the lower extremities, from this cause is rare. If there be paralysis of the trigeminus, there may be destructive inflammation of the eyeball.

The paralysis which arises from tumour generally comes on slowly, and is preceded by pain, but occasionally, especially in syphilitic tumours, quite suddenly. The general symptoms produced by cerebral tumour are very various; irritation of the stomach and constipation may be the most marked, but the existence of other signs of tubercle, syphilis, and cancer, as well as the age of the patient, will help to a right conclusion, as to the cause of these—especially if a convulsion occur. Thus tubercle is most common in children, syphilis in youngish people, and sarcomata and gliomata in those somewhat more advanced in life. Later still comes carcinoma. Carcinoma is usually of the medullary kind, and may originate in the brain or its membranes or spread from neighbouring parts, as the eyeball. The tumours are usually single and belong to the cerebrum. They readily undergo partial degeneration. Sarcomata too are frequently found. They mostly consist of spindle cells and are surrounded by a kind of membrane; their tissue is mostly soft, and they are usually found in the cerebrum. Gliomata are almost peculiar to the brain and eyeball. They are

formed at the expense of the fine connective tissue of the brain (neuroglia). They are not defined, but pass into the healthy brain substance. Such tumours were formerly included under the head of cancer. Myxoma, cholesteatoma, and lipoma all find occasional representatives in cerebral tumours. They are named in the order in which they are most frequently found. Tubercular masses are among the commonest representatives of brain tumour. They constitute round yellowish masses of various sizes, sometimes as big as a pigeon's egg and of a yellowish cheesy texture. In most cases they are easily enucleated, but if recently growing this may not be the case. They are usually found towards the back of the brain. Tubercular masses, by pressing on the veins of Galen, may obstruct the outward flow of blood, and so give rise to spurious ventricular hydrocephalus. Syphilitic gummata are now assumed to be of frequent occurrence, often on no very good evidence. The headache they give rise to frequently undergoes nightly exacerbation. Their site is rather in the membranes, especially the dura mater, than in the brain itself. Aneurism of the cerebral arteries is most frequent in those of some size—the basilar, the middle cerebral, or those of the circle of Willis. Recently, however, it has been shown that aneurisms of much smaller dimension, in vessels even of capillary size, are frequent, and are of great importance, as giving rise to cerebral hæmorrhage. These of course give rise to no sign. Hydatids and cysticerci have both been found in the brain. The cysticerci usually occur in great numbers, the hydatids form a single tumour. The cysticerci are usually near the surface; and from their irritation and numbers often give rise to convulsions and mental disturbance, whilst their small size does not give rise to paralysis. Other growths there are in the brain, as fibrous and osseous tumours, melanotic growths, erectile tumours, cysts, and calcareous concretions, but they do not admit of diagnosis, and are really pathological curiosities.

The existence of a cerebral tumour having been made out, say by the gradual onset of headache, irritability, loss of memory, and dulness of sight and hearing, with at the same time suffering from any over-excitement of the eye or ear, numbness, tingling, and giddiness—above all, convulsions without coma, and irregular paralysis of the facial or other muscles—we must try to localize it if possible.

In the case of tumours affecting the upper surface or convexity of the brain, the signs are far from definite. They are mainly these: headache, convulsions of an epileptiform character, mental disorder, but rarely paralysis or aberrations of sense. When the anterior portion of the cerebral hemispheres is mainly or solely affected, we find, as before, headache, general or frontal, hemiplegia, convulsions of an epileptiform character, psychical disturbances, and, above all, disorder of speech, usually aphasia; rarely are the organs of special or common sensation disturbed. When the middle lobes are affected, we find disturbance of the intellectual and motor powers to a greater or less degree, but here the tumour tends more to interfere with vision and to press on the optic thalami, so as to give rise to general anæsthesia, specially characteristic of a lesion in this situation. Where the posterior lobes are the seat of lesion, we have, as usual, headache, but this is probably occipital; convulsions of an epileptiform character, incomplete hemiplegia, and when the mass presses on the veins of Galen so as to obstruct the outward flow of blood, impairment of intelligence and sensibility.

A tumour at the base of the skull would be recognised by the nerves implicated. Usually these comprise one or more divisions of the trigeminus, producing anæsthesia of one side of the face; and if the ophthalmic division be affected, probably also inflammation of the corresponding eyeball. Other nerves, including the olfactory, optic, and motor nerves of the eyeball, with the facial and auditory, may also be affected if the growth be extensive enough. If the great basal ganglia be alone affected, we have complete hemiplegia of one side, often preceded by motor symptoms indicative of irritation, such as rigidity and convulsions, complete anæsthesia of the same parts, loss of the power of speech—*i.e.*, of articulate speech, not of language,—and some disturbance of intelligence. Tumours affecting the corpora quadrigemina are mainly indicated by convulsive movements and interference with vision, so that there is loss of power over the pupil and orbital muscles commanded by the oculo-motor, but not the abducens. When one crus is affected, we find paralysis of the opposite side, with disordered sensation if the upper layer of the crus be affected, and usually paralysis of the oculo-motor on the same side, but no interference with intelligence. When the pons is

the site of the tumour we may expect paralysis of the opposite side, including anæsthesia of the face, or facial paralysis on the same or opposite sides, and some interference with vision. Sometimes there is paralysis or rigidity of some of the muscles of the spinal column, giving rise to very peculiar symptoms. These are, however, more marked in tumours of the cerebellum and its peduncles, giving a peculiar tendency to rotatory movement in various directions—sometimes a tendency of one side to go faster than another, so that the individual walks round and round in a circle. Tumour of the medulla oblongata is indicated by paralysis or irritation of one or more of the nerves originating there—the motor root of the trigeminus, the facial, auditory, and abducens, the vagus, hypo-glossal, glosso-pharyngeal, and spinal accessory. Usually the paralyses are grouped in certain orders mainly dependent on the exact sites of the nuclei of these nerves.

Treatment.—The prognosis in a case of cerebral tumour will depend on its nature, but the only kind which promises well is the syphilitic. Too frequently, however, the diagnosis of cerebral mischief as syphilitic is due to the result. It would be better to call them cases of cerebral disease which got well with iodide of potassium. Certainly this remedy holds out abundant hope where there are cerebral symptoms coupled with a history of syphilis, and it is just as well to try it in others. But to do good, it must be given in large doses—30 or 40 grains three or four times a day; and if the history be clearly syphilitic and no mercury has been given, the two should be combined (℞ Liq. hydrargyri perchloridi ʒj, potassii iodidi grs. xxx, mistura gentianæ ʒj; pro dosi ter quaterve in die), or the inunction plan of using mercury may be tried. When there is much pain, the hypodermic injection of morphia is the best remedy, coupled with the free local use of ice. This last remedy is of most value where there is a tendency to hyperæmia of the brain. Some authorities speak very highly of Cannabis Indica. The extract is the best preparation, and should be given so as to slightly affect the head. For obtaining sleep, chloral hydrate should be given in 20-grain doses, and if convulsions are threatened, bromide of potassium should be given in doses of at least the same magnitude. Everything should be done to prevent hyperæmia: than this there is nothing more important, and the best means of obtaining our end is to insist on absolute quiet and a mild, unstimulating

diet. Deep blistering and setons are not conducive to peace and quiet.

SCLEROSIS OF THE BRAIN.

Under the title of cerebral sclerosis have been grouped certain peculiar symptoms, chiefly paralysis of certain groups of muscles of the most irregular kind, gradually extending and implicating more and more important groups till death results. Trembling of these muscles is a notable phenomenon, and mental depression is usually great. There is often pain in the parts affected, or a sense of tickling passing into anæsthesia. The malady is a very chronic one. After death milk-white spots of hardened tissue are to be found in various situations throughout the brain. These consist of connective tissue and the remains of the normal brain elements.

INSANITY.

The condition variously described as insanity, lunacy, madness, unsoundness of mind, mental alienation, &c., is one of great complexity and hard of definition. From a legal point of view, perhaps, the term unsoundness of mind is the least objectionable, but it is certainly hard to draw the line between harmless eccentricity and such a degree of unsoundness of mind as demands the interference of others. Insanity has generally been classed among those unsatisfactory maladies called functional; but as in other cases, its various forms are rapidly being resolved into maladies depending on real, though microscopical lesions, and it is fair to presume that the same may ultimately be done for all the forms of insanity as has already been done with regard to some of its more striking varieties.

The varieties of insanity as generally recognised in this country are:—1. Mania; acute, recurrent, or chronic. 2. Monomania. 3. Melancholia. 4. Moral insanity. 5. Amentia—*i.e.*, idiocy and imbecility. 6. Dementia. 7. General Paralysis of the insane.

Decidedly the most important *predisposing* cause of insanity is inherited taint. This may not amount to actual mental weakness, but the mind may be unable to grapple with the difficulties of life in our complex state of civilization, and may give way under them. Between absolute idiocy therefore and a tendency to become "queer"

under worry, anxiety, or over-work, we may have every variety of congenital imperfection of mind. Such imperfection is most frequently handed down from insane ancestors, but it is not necessary that the parents or even the grand-parents should be insane: the taint may be shown collaterally in uncles, aunts, or even in more remote relations, whilst in the parents this tendency may be exhibited only in an increased degree of proneness to nervous disease, or may not be shown at all.

At all events, inherited imperfection of mind or brain may be greatly aggravated by errors of education, just as by the same means, rightly used, they can be greatly lessened. It may not be possible so to strengthen the mind as to enable it to resist any unusual strain, but certainly it may be so trained as to enable the individual to fulfil all the duties of a good citizen in a calm, orderly manner of life. Unfortunately medical men are seldom consulted in such cases; if they were so, their sound advice, if followed, might be fruitful of the best possible results.

Given a mind strongly predisposed to insanity, almost anything may suffice to turn the balance to the wrong side; but even with minds moderately strong, some of the trials to which men are subject may be too much for their mental stability. Even severe strain of the mind for a certain length of time may so far predispose to insanity, that very slight causes will suffice to overcast the mental powers for a time. This has frequently been observed in the case of men engaged in literary work of an exhausting kind. It is not, however, from the intellectual side, but rather from the emotional side of our moral being that danger most frequently arises, and though exultation may sometimes be able to overturn the intelligence, this far more commonly follows on feelings of distress or depression. Grief, fear, anxiety, jealousy, and disappointment, perhaps even more a wounded self-esteem, are the most potent mental agencies in producing insanity.

Of the physical causes of insanity it is common to put intemperance first, but it is probable that this is so, chiefly in those already predisposed to madness by inheritance or acquired taint. Sexual conditions, especially at puberty, and again in females at what is termed the turn of life, when the menstrual function becomes unsettled, and still more when the proper sexual impulse becomes perverted, are potent causes of insanity. One form of insanity, that arising from self-abuse, is about the most disagreeable it is

possible to encounter. Epilepsy and insanity often go together, and the class of epileptic maniacs is one of the worst with which we have to deal—an unthankful duty, and a dangerous one. In females disorder of the sexual functions not unfrequently leads to hysteria, and this in its turn to mania of an erotic and offensive character. Syphilis, injuries to the head, prolonged exposure to extreme sunheat, may all act as causes of insanity. Still more powerful is the influence of the generative function on women, in whom puerperal insanity—meaning thereby the insanity of pregnancy, of delivery, and of lactation—is too frequently developed.

Mania.—In that form of insanity called mania, the mind is spoken of as being in a state of exaltation. The actions are excited, the patient shouts, runs about in a frenzied sort of manner, in short, conducts himself after the fashion we are apt to call "raving mad." This stage of the malady, however, is usually, though not invariably preceded by one of depression or melancholia. The patient becomes restless and sleepy; he is extravagant in his behaviour as regards words and demeanour. There may be no delusions, but the flow of ideas is remarkably swift: they come and they go, and are converted into acts without a moment's hesitation. Both the powers of perception and of reasoning on what is perceived are arrested or in abeyance, and the ideas which rush so rapidly through the patient's head have no coherence and no likeness to actual facts. In this state both hallucinations and illusions are common. The temperature is increased, especially towards night, but the pulse may not be greatly disturbed. The skin is usually dry and harsh, and emits an offensive odour, especially if made to perspire. The bowels are commonly constipated.

The disease does not run an unchequered course: there are often remissions, or apparently complete intermissions. In some instances the attacks recur periodically, or periods of melancholia may alternate with those of mania. When recovery takes place, it is usually within twelve months of the onset of the malady, and the longer it lasts the worse the chance of recovery ever taking place. If recovery does not occur, the patient usually sinks into a condition of chronic mania or dementia. Death may occur from exhaustion or from some intercurrent malady, especially lung disease, which comes on most insidiously, and often markedly resists treatment.

Puerperal mania, a variety of the preceding, is most common in primiparæ, and usually comes on not long after delivery. The patient is sleepless, restless, and incoherent; she is mischievous and suffers from hallucinations. There is often a suicidal tendency, and there is risk to the child if allowed near her. Yet, though excited, the features are pinched and shrunken, the pulse feeble, but quick and irritable, and the skin clammy. Most of these patients recover in a short time if properly dealt with; but some tend to pass into a condition of dementia.

Recurrent mania is another form. During the intervals of the attacks the patient may seem almost well, but presently he becomes as bad as ever, and this continues until the mind is permanently weakened, and the patient passes into one or other of the chronic forms of insanity. The prognosis is particularly bad in it.

In *monomania* we have this distinction from mania, that whereas mania shows itself conspicuous for the want of thought or its momentary passing into action, in monomania the malady evinces itself mainly by some settled delusion to which all other thoughts and acts have reference. This delusion almost invariably ministers to self-esteem and grandeur: the patient's position is high and mighty, his power unbounded, his wisdom unequalled, and his skill unparalleled. If these attributes are not conceded to him, his violence may become excessive, for every thought and action seem to be more or less perverted by these unsound ideas, which of course vary exceedingly in different instances, most frequently with some reference to the education and occupation of the individual, or to the events in which he has taken part. Recovery does not often take place. The whole phenomena of the disease tend to show that, though apparently slight in outward manifestations, it is deeply rooted and intractable. It commonly ends in dementia.

In many respects similar, yet in manifestation totally different, is *melancholia*. Usually this begins with profound depression, which expresses itself in various ways. The patient shuns society, and looks on former friends with dread and dislike. He may be conscious of the change, but the more it preys on his mind, the more self-absorbed he becomes, until this finds expression in delusion. This delusion invariably takes the depressed form: the patient has committed some nameless offence, for which

no suffering can atone; he has been guilty of the unpardonable sin, for which there is no repentance; he has wasted his means and brought himself and his family to beggary, &c. Frequently also such patients will suffer intolerable anguish on account of some trivial action which they think was wrong, but this is not so marked after their delusions have been fairly established. In all such lunatics there is a strong tendency to suicide and little tendency to recovery.

Melancholia is a common form of insanity, among women especially, during pregnancy and lactation and about the climacteric period. Another very striking form of it, is what is called melancholia attonita, where the patient sits as if struck dumb and motionless, everything going on around being unheeded. Every want is unheeded, and the patient has to be moved from place to place like a piece of furniture, being all the time possessed of one fixed and terrible delusion. Melancholia tends to be a chronic malady, in which remissions may occur. A considerable proportion get well. Some pass into chronic melancholia, some into dementia. Death may occur from various causes. A considerable proportion of patients would perish by refusing their food, but this should not be permitted. But the subjects of melancholia are prone to other maladies, as phthisis, or some form of lung disease.

The condition called *moral insanity* is hard of definition, inasmuch as almost every crime under the sun has been accepted as proof of its existence. The original moral insanity was one where, without any exact proof of mental derangement, there was evidence of hereditary taint; but this idea has long been departed from. But the same kind of symptoms may afford the earliest signs of approaching mental derangement, especially of general paralysis. In such cases of true moral insanity an individual of good position and education may suddenly or gradually come to show all that is revolting in human nature, become a shameless thief and liar, and in every respect exhibit the characteristics of a thorough-paced ruffian. Perhaps in this group too ought to be included what constitutes the great bulk of the criminal classes—those individuals whose mental capacity is only a degree above imbecility, and in whom evil training has developed all that is bad in their imperfect natures.

Amentia is the term sometimes applied to the con-

genital absence or imperfection of mental powers designated by the terms idiocy and imbecility. In such individuals there are often marked indications of imperfect brain development. This may be only unusual smallness, but there are also not unfrequently deficiencies of certain parts, or unequal growth of different portions of the brain substance. Very often the skull is what we denominate microcephalic. The term idiocy is that applied to the most extreme degree of congenital imperfection, though it is often used to cover a less degree of the same, commonly termed imbecility.

Extreme idiots are utterly destitute of intelligence, and hardly sensible of the wants of nature. They cannot speak beyond giving emission to a grunt, and the senses are feeble, badly developed or imperfect, and they are liable to epileptic convulsions. Between these and imbeciles, who are only a little worse than people who are allowed to be at large, to manage their own affairs and fulfil all the duties of life, is only a question of degree. Idiocy is powerfully influenced by inheritance; marrying in and in in the same family is commonly supposed to favour its development, and, if there is any mental weakness in the parents, this of course materially fosters its appearance. Though for the most part congenital or developed early in life, both idiots, except the lowest grade already alluded to, and imbeciles, admit of great mental improvement by proper training, and to this of late years much attention has been directed. A remarkable form of idiocy seems endemic in certain parts, especially some Swiss valleys. This is termed cretinism, and is associated with goitre.

Dementia is the state into which, sooner or later, most mental disorders tend to pass. In it as in idiocy or imbecility there are degrees from slight loss of mental power to that extreme stage where there are no indications whatever of mental life, and it is much as if a mind had never existed. Dementia may be a primary affection—that is to say, it may show itself before any other sign of insanity, especially after certain acute diseases or severe mental shocks, and from this acute dementia recovery is frequent. More frequently, however, dementia is the ultimate outcome of mania, melancholia, monomania, and the like. The great bulk of asylum patients belong to this class, and in all workhouses are to be found numbers of old people who, with waning bodily powers, have also lost what little mental capacity they once possessed, and who have sunk

into what is called senile dementia. In these the disease may be said to be primary, but it differs altogether from the primary dementia already referred to, that tends to get well; all other forms of dementia tend to pass from bad to worse. In most cases, however, the patients cannot be said to die of this form of malady; usually they perish from some intercurrent mischief, very often of the lungs.

General paralysis of the insane is the name given to a malady characterized by certain bodily and mental signs at once peculiar and pathognomonic. The mental symptoms in the earliest stages resemble those of the most exalted monomania. The paralytic symptoms usually begin with some signs of imperfect control over certain organs, especially those of speech; both tend to progress.

The subject of incipient general paralysis is usually filled with the most exalted notions of his powers and his position, but these notions vary from day to day. Frequently too the moral nature is entirely changed: men will lie, steal, expose themselves in public places, be guilty of all kinds of filthy actions, who when well were notable for the very reverse. Sometimes general paralysis is accompanied by depression rather than exaltation, but such cases are exceptional. In the early period, such patients, who are for the most part men in middle life with muscular power but slightly impaired, constitute some of the most dangerous lunatics in an asylum. Later on, though they are equally liable to fits of violence and excitement, they have not bodily power to make themselves dangerous, and are more likely to suffer themselves from the effects of a struggle. In the later stages of this malady mental decay is complete.

The bodily symptoms are equally characteristic. They begin with some loss of power over the tongue and articulation: there is hesitation in utterance and a tremulousness about the upper lip, and the tongue when protruded—all of most sinister omen. Next the limbs become affected: dragging somewhat along the ground—that is, not properly raised at each step, so that the patient is apt to trip; asked to turn suddenly, the want of due control is still more marked, and he will run a risk of being thrown down. Co-ordination of motion for certain purposes is early lost; for others, especially of the more automatic kind, it is longer retained, but sooner or later disappears in all. Even the sphincters lose their power, and the muscles

of the pharynx their capacity for transmitting food and drink, insomuch that the patient often dies from accumulation of food in the pharynx pressing against the trachea or even entering it. Epileptic fits are common in the course of the disease or may terminate it. The condition of the surface is very peculiar. Sensibility is early impaired and finally lost, yet we sometimes see it extremely hyperæsthetic, so that the weight of clothes can hardly be borne and the least touch gives pain.

Unfortunately there is but one end to this malady—that is death. It may come sooner or later—very seldom being delayed five years from the first onset of the disease. Often in its progress there are periods when it seems not to advance or even to retrograde; but these are fallacious, and if the patient be not carried off by some intercurrent malady, he finally perishes the most miserable spectacle in the world.

The diagnosis of insanity, especially for legal purposes, is very often far from easy. You require not only to convince yourself, but to arrive at facts which will suffice to convince another not so skilful—possibly, an obtuse juryman. Indeed, this is not a bad criterion to hold constantly in view in dealing with lunatics, especially in the way of signing certificates. You should always bear in mind that the case may come before a jury, and therefore it is advisable to try to procure evidence which shall be intelligible and satisfactory to minds of such a level. To satisfy your own mind, however, is a different thing; and so we may dismiss that bugbear to many, the clever impostor who tries to sham insanity: he invariably overdoes it, and so is easy of detection.

In meningitis with delirium we have contracted pupils, quick, hard pulse, and high temperature, intense pain in the head, and the tendency to convulsions. In delirium tremens of the common type, we have the restless, busy delirium, the peculiarly horrible nature of the illusions, the tremulous, coated tongue, and the generally shaky condition. It must not be forgotten, however, that a prolonged fit of intemperance will in certain subjects give rise to mania instead of delirium tremens. Of the diagnosis of one form of insanity from another, enough has already been said. This, however, must be borne in mind—that of many subordinate branches and shades of insanity we have been unable to speak at all.

Treatment.—The first rule now laid down in the treatment of insanity is prompt removal from the scenes and surroundings amongst which the patient fell ill. This of itself will often suffice for a cure. Next in value, if not even superior, is skilled attendance. Restraint is essential, and no one knows how better to make use of moral restraint than a skilled lunatic attendant. To change the mode of life is a great object, and simple amusements are very beneficial; but, upon the whole, nothing seems to suit so well as some manual employment, especially, in favourable weather, out of doors. It is highly advisable to avoid arguing with a patient on the subject of his delusion; to put it aside in a pleasant way, as a thing not fit to be discussed, is, perhaps, the best plan; but here too a skilled attendant can do more than the practitioner, seeing the patient only from time to time.

As to medicines, we have little in which we can put trust. In greatly excited maniacal patients, some controlling remedy is often of great service. Such is digitalis, given in large doses of about an ounce of the infusion or drachm doses of the tincture. Bromide of potassium sometimes does good in such cases also. In these same cases the tepid bath with cold water to the head has been strongly recommended. Where sleeplessness is a troublesome feature, chloral in 30-grain doses may be tried, and in certain cases where there is a tendency to depression rather than exaltation, opium may be given. This last drug is best exhibited in ¼-grain doses of acetate of morphia subcutaneously. We need hardly say that mechanical restraint is not to be used except it is clearly the best thing for the patient. Then the practitioner has no more right to refuse it than he would have to apply it where it is needless.

HYPOCHONDRIASIS.

This very inappropriate name has been given to a form of malady characterized by excessive depression of spirits, occurring without any sufficient cause, and frequently accompanied by delusion as to the patient being the subject of some disease, which he says he suffers from, but which has no real existence. There is thus an important distinction between such a patient and one actually suffering from disease, and whose whole mind is con-

tred on his ailment. It will be seen that hypochondriasis approaches very near to insanity, its most striking peculiarity being the character of the delusion, which always relates to some supposed morbid condition of the patient. The malady is essentially one to which males rather than females are liable; it does not occur in childhood. The patient concentrates his attention on some part or organ until he conjures up some phantom disease in which he is henceforward a devout believer, in spite of all evidence to the contrary. The patient is not, however, absolutely well: he suffers from symptoms of indigestion, especially flatulence, foul tongue, disordered bowels, and capricious appetite. These symptoms may or may not be signs of local disease; commonly, however, they are. Pain is always complained of more or less, but the sensation is subjective—*i.e.*, the result of central, not peripheral stimulation, as it disappears when the patient's attention is directed from his sensations. The pain complained of is usually of a burning character. The ideas as to the cause of this pain are not fixed, and often, as the patient consults various authorities, or takes to studying works on medicine for himself, these ideas are of the most incongruous nature, and so easily penetrated. Unfortunately such patients are not readily convinced, whilst they easily take offence if due importance—or what they consider due importance—be not attached to their supposititious maladies. Hence they are too apt to abandon an honest practitioner, and to fall dupes to some charlatan, who will fleece them easily. The victims of what they fancy spermatorrhœa most frequently belong to this class, and as frequently have nothing the matter with them. Sometimes the mental derangement, if such it can be called, goes a step further, and a real hallucination or delusion exists, as when a man persuades himself he is with child, or fancies he is made of glass.

The diagnosis of hypochondriasis is essentially a process of elimination. A patient fancies he has got a certain disease, or the signs of such disease, and we must determine whether this is so or not. If not, and the patient exhibits the other signs of hypochondriasis already alluded to, we may fairly conclude that he is the subject of that malady and no other. Sometimes it is not easy to discriminate between hypochondriasis and melancholia. There is one important distinction: the true melancholic is often suicidal; nothing is further from the thoughts of a

hypochondriac than anything which will harm himself.

Treatment.—The first thing to be done is if possible to get the patient out of himself, to divert his mind from his imaginary sensations. But this is never to be done by pooh-poohing his disorder, which to him is fearfully real. If possible, we should try to get him interested in what is going on round about him, and to this end nothing is so conducive as travel and constant change of scene. This may at first seem useless, but by-and-by the patient begins to take more and more notice of men and things. At the same time his health improves, and he may return a totally altered man. It is then very important that he should not fall back into his old way of life. Sedentary occupations are to be avoided as much as possible, and the patient should indulge freely in exercise in the open air. As to medicines, the bowels should be regulated—they are ordinarily confined—and iron and strychnine given. Frequently an alkali in a bitter is a valuable remedy.

ECSTASY—CATALEPSY—SOMNAMBULISM.

The two conditions ecstasy and catalepsy are closely allied. In them, all mental power is concentrated on one object to the entire exclusion of others. As a consequence, all voluntary motions are in abeyance, and the subject maintains one posture, whatever that may be. But between the two there is this difference—that whereas the results of this concentration are remembered in the case of ecstasy—most frequently called visions or revelations—in catalepsy they are completely forgotten on recovery if they ever did exist. Minor degrees of ecstasy are of frequent occurrence during periods of powerful religious excitement, in some sects and creeds developing themselves in motion, as in the sect now called Shakers, in Dancing Dervishes, and the like. This condition is eminently contagious, and of this no better example can be afforded than by the so-called Dancing Manias of the middle ages. Something too of the same kind was then seen in the case of the Flagellants, who roamed about from town to town during the period of the Black Death, and in the extraordinary pilgrimages of children. In all of these this mental excitation, but excitation of one faculty — generally

religious feeling—only manifested itself in extraordinary behaviour; in others, as in some of the middle-age saints, there was complete suspension of movement, the subjects remaining night and day in the same attitude, frequently that of prayer.

Catalepsy is more strictly speaking a medical complaint, for in ecstasy the practitioner is seldom called upon to interfere. In catalepsy the patient's senses and bodily powers are completely suspended, and there is usually some stiffness of muscles, so that the patient retains for a time the posture in which he or she was when attacked, and the limbs if forcibly moved tend to retain their new position. Very often these attacks are preceded by truly hysterical or even epileptic symptoms, just as catalepsy itself may be the prelude to some more formidable disorder. Usually it is the product of some mental emotion of whatever kind acting on a badly balanced brain, or hysterical constitution. Hence both ecstasy and catalepsy are to be treated on principles similar to those ruling our procedure in hysteria. In every way the health is to be strengthened, and in every way self-control is to be inculcated, and the patient brought to exercise it. To some cataleptic patients galvanism would probably be found useful.

Somnambulism, or sleep walking, is of very various degrees. In its most marked states the ideas which pass through the mind, even in sleep, are translated into action during sleep, and may be completely forgotten on waking. In minor and more common degrees the ideas of sleep—*i.e.*, dreams, are carried into action, whilst yet the patient is half awake, or he is wakened by carrying these into effect.

HYSTERIA.

It is often said that what hypochondriasis is in the male, that is hysteria in the female; but this is far from true. We may have hysterical males, and hypochondriacal females. This fact effectually severs the necessary connexion of hysteria and uterine or ovarian irritation, especially from uterine ulceration and flexion and ovarian tumours; though doubtless they are frequently associated. In point of fact, it is the nervous system, central and peripheral, and not the sexual organs, which are in hys-

terics at the root of the mischief. The olden idea of hysteria was that of a convulsive attack, but such attacks are, comparatively speaking, rare, even in markedly hysterical patients. The mental state is more important. It seems doubtful whether the sensory or motor tracts are more at fault, but in reality most of the so-called morbid sensations experienced in hysteria are subjective, depending on disorders of the cerebral centres; sometimes these same disorders may manifest themselves in motor acts, which are more or less under the control of the will. But that the sensory tracts are also implicated is shown by the increase of reflex irritability, always marked in hysterical subjects.

Hysteria most frequently begins about puberty—that is, from twelve to eighteen years of age, and it may remain more or less marked during the patient's future life. Sometimes it disappears about the time of the cessation of the menses, or it may then be developed for the first time. Hysteria seems on the whole to be more frequent among the single than the married, but does not depend necessarily on either state. Want of occupation, reading foolish books, or indulging in day-dreams, seem to have a good deal to do with the manifestations of hysteria, though when it appears in men, it often depends on over-work rather than the want of it. As in most diseases of the kind, there is a great tendency to inheritance.

In the hysterical state the will is perverted, and, according to the patient, not under her control. In a certain way this is true, but this want of power over voluntary acts depends in reality on the absence of the necessary stimulus, which being present, they are promptly performed, as when an apparently paralysed patient jumps out of bed on an alarm of fire. Such patients are usually strongly emotional, but their ideas are centred almost exclusively in themselves. At one moment they are laughing, at another crying, sometimes both together. These patients too are liable to certain peculiar nervous manifestations, as somnambulism, catalepsy, and the like. Sensation is usually perverted, either as hyperæsthesia or anæsthesia; there may be exaggerated power of sensation, especially of hearing, but there is also a condition where this causes acute pain—that is to say, impressions which would hardly affect a healthy individual are to the hysterical patient so strong as to be painful. There is generally some tenderness on pressure of some part

or other of the surface, or there may be complaints of pain without any visible cause for it. The sites of pain are most frequently the left side, the top or back of the head, along the arms in the course of the median nerve, the breasts, the loins, over the sciatic, and over the sacrum, and the joints are also affected in a most puzzling manner. Breathing, and the beating of the heart generally give annoyance. One of the most characteristic signs of hysteria is the so-called "globus hystericus." The patient complains of uneasiness in the side, or pit of the stomach, and soon after experiences a sensation as of a ball rising and settling itself in the throat. Here it gives rise to choking sensations, exceedingly disagreeable. This ball seems as if it cannot be got to move by any effort on the part of the patient, though all kinds of expedients are freely tried. Anæsthesia is sometimes encountered, but this seems rather to take the form of indifference to pain (analgesia), than want of sensation. The motor powers too are perverted; the patient tells you she cannot do this, that, or the other thing, but again we find her indulging in certain violent exertions altogether beyond her ordinary power. Emotional and sensational movements are always exaggerated, and many reflex acts are so also. These for the most part assume the character of spasm, as spasms of the motor-oculi, or abducens, or facial nerves, of the pharynx and larynx; or take the form of asthma, cough, hiccup or belching.

Apparent paralysis of some part or organ is exceedingly frequent in hysteria. Hemiplegia and paraplegia are most frequently simulated, but so also are paralysis of some of the muscles of the eye, or the glottis. In reality almost every form of paralysis the patient has seen or heard described may be assumed. Careful attention will enable any one to distinguish the forms of hysterical from real paralysis. If a hint be dropped one day that such and such a sign ought to be present, it will generally be found next day.

Such is the general condition of the hysterical patient, but from time to time there are outbursts of the malady of a different kind. These paroxysms somewhat resemble epileptic fits, but the *insensibility is never complete*, and there are other distinctions. Sometimes the fits are very severe, but they never occur during sleep, or when the patient is in a position of danger or of discomfort—neither do they occur without onlookers. The tongue is not bitten, and the breath is not held to asphyxia; there is no

squint, and they do not end in coma. Besides, the patient's history enables us to tell them from the more serious epileptic paroxysm. We have also signs of interference with the vaso-motor system in an excessive flow of limpid urine, flying heats and chills, irregular perspirations, and occasional salivation.

The pathology of hysteria seems to resolve itself into a want of mental balance: the emotional side of the character is allowed to develop itself at the expense of the controlling power; and this being said, all is said we can, beyond saying that this involves imperfect nutrition of the nerve centres.

The *treatment* of hysteria is far from satisfactory. Too often the patient is under the control of parents and relations who at one time scold, at another time coddle her, and the practitioner is thus often thwarted. In point of fact an hysterical subject, of whatever grade, is often better in a hospital ward under a judicious nurse than in the most luxurious surroundings; but then these same patients when they go out, are almost certain to fall back. Moral treatment is far more important than medicinal, and sound judgment is better than medical skill. At the same time, everything should be done to improve the patient's general health, and if she can be drawn out of self-concentration, so much the better. Patients are rarely well if hysterical; they require therefore that their bodily condition should be carefully studied and every local cause of disease removed. To this end, the functions of the bowels and genito-urinary organs should be well considered and carefully regulated.

With the exception of assafœtida and valerian, the whole list of so-called antispasmodic remedies seems to be useless. Assafœtida should be given in doses of 5—30 grains or so; valerian as tincture in drachm doses. If there be much pain, morphia given hypodermically is good, especially if there is want of sleep, but the giving of opium in hysteria is dangerous, as tending to set up a craving for the drug. Spirits of chloroform, ammonia, and ether are good if there be much tendency to spasm. Tincture of iron, quinine, nux vomica, and other strengthening remedies are almost always of use. In the paralyses of hysteria the use of Faradization is the most valuable application, and often cures hysterical aphonia as by a charm. The value of change of air and the use of cold water in hysteria is very great. Sea-bathing is perhaps

the best, but sometimes mineral waters are equally strongly to be recommended, or even a residence at a well conducted hydropathic establishment, whose physician is not given to fooleries in practice. When hysteria is dependent on uterine or ovarian irritation, hip or sitz baths of tepid water have frequently a most beneficial influence.

CHOREA.

Chorea, which in this country is also known as St. Vitus's Dance, is a malady characterized by involuntary movements of various kinds, affecting various groups of muscles, and having the appearance of being voluntary in their origin. They vary in degree from slight intermittent spasm of one or two muscles to almost continuous movement of every part of the body, carried on not only without the will, but against the will of the patient, and complicating every kind of voluntary motion. Chorea is essentially a malady of the motor-nervous system, in which deficiency of the co-ordinating power is prominent. It is moreover a malady of early life, beginning most frequently about the period of the second dentition or about the age of puberty, and seldom making its appearance after the patient has ceased to grow. In most cases it appears about seven, and may again do so about fifteen, sometimes at both periods in the same individual, hence has arisen the idea that it returns every seven years. Like many other maladies of the nervous kind it has a tendency to become hereditary. There is, however, a very extraordinary connexion between rheumatism and chorea which is not well understood, and in many cases of chorea morbid sounds may be heard over the heart, some purely anæmic, some, it may be, due to irregular action of the columnæ carneæ, but in many cases they are also undoubtedly due to valvular disease. This connexion has led to an idea as to their pathology which cannot, however, be maintained. One idea suggested was that the irregular movements were due to separation of small masses of deposit from the edges of the diseased valves and their subsequent deposit in the motor centres of the brain, especially the corpora striata. But the connexion of chorea and heart disease, though frequent, is not necessary, and hence the supposition falls to the ground. Mental emotion has a good deal to do with the phenomena of the disease, for the more the patient tries to

control the involuntary movements the worse he becomes. In females, in whom the disease is most frequent, mimicry is a powerful exciting cause, so that it may even seem to become epidemic. In adult females pregnancy sometimes seems to set up the malady.

Chorea begins gradually. The child cannot sit still, drops things, and is increasingly awkward in performing all ordinary acts which require the exercise of volition, which is perhaps most noticeable in eating. Presently it begins to make grimaces, and cannot keep the hands quiet. All the movements are jerking, and the involuntary motions seem as distinctly acts of the will as those the patient desires to make. Herein therefore lies a distinction between the movements of chorea and epilepsy; in that those of epilepsy never can be taken as volitional; those of chorea most frequently appear to be so. In marked cases the face is twisted into all sorts of shapes, the eyes turned hither and thither, the arms and legs are kept in constant motion, and when the patient desires to perform any act, he never can tell what the result will be. The patient cannot sit, but slides off his chair; he cannot lie still in bed, but continually turns about; the jaws are twisted from side to side; often the tongue is protruded and bitten worse than in epilepsy. The muscles of respiration are rarely affected. This may go on to such an extent that the teeth are ground down in their sockets and the alveolar processes of the jaws are shed, the bone becoming necrosed. The same constant movement induces bed-sores on the back, knees, heels, and elbows, which cannot be got to heal, and the advanced stages of the worst forms of the malady constitute one of the most miserable sights possible, especially as sleep is rarely practicable. In the early stages sleep may be fairly sound after the patient falls into it, but this is not easy, owing to the constant movements. These, of course, are aggravated cases.

In the simpler forms there may be little more than slight twisting of the face, an inability to sit still, and a restlessness as regards the hands and arms. But in most speech is indistinct from inability to correlate the muscles of articulation. Eating may be difficult, but swallowing and breathing are usually unimpaired. The other functions too may be fairly performed; the mind is clear if the patient has the power of expressing himself, though in the severer and more advanced cases the faculties are blunted, if not impaired. In such too the patient is thin

and emaciated from want of rest and the difficulty of taking food, but in ordinary cases this is not noticeable.

Chorea tends to get well, the malady usually lasting from eight to twelve weeks, but in some it may persist in a more or less aggravated shape for life. Local choreas are more liable to persist than the more general forms of the disease.

Treatment.—As the tendency of chorea is towards recovery in a definite period, especially with good food and rest, it is not easy to estimate exactly the value of remedies. Those chiefly given have been iron, zinc, and arsenic. If the uterine functions are disordered, or if from any cause anæmia arises, iron is most likely to do good; it is best given in the form of mistura ferri co. in ʒss or ʒj doses three or four times a day, the bowels being kept open by pil. aloes. In children the syrup. ferri iodidi, or syrup of the phosphates, is the best preparation of iron; they may be given in ʒss doses along with cod-liver oil, if necessary. Zinc is best given as oxide or sulphate. Of the latter two or three grains should be given to begin with, gradually increasing the dose to as much as ten or fifteen, or until the dose induces sickness, when it should be discontinued for a time. Arsenic is highly recommended; it should be given as liquor arsenicalis in ♏v doses, after food, gradually increasing the dose till the eyes redden and water and there is some nausea: but if the stomach be upset by the medicine it must be discontinued. In such cases the hypodermic injection of the remedy has been recommended, but of this practice experience is limited. Strychnine is another remedy deserving attention: its dose as liquor strychniæ is ♏x. Antispasmodics, as valerian and assafœtida, have been tried from time immemorial, and generally found useless. The value of the more powerful vegetable neurotics has yet to be determined. Some speak highly of them; others of equal repute decry them. The use of the continuous galvanic current has also been highly recommended, and should be tried with a strength just strong enough for the patient to feel it; whilst, if the chorea be complicated with rheumatism, warm alkaline and sulphurous baths are of the greatest value.

In some cases the patients must be put to bed, and the sooner they are placed on a water-mattress the better, if the movements be at all violent. To keep them at rest morphia may be given in tentative doses, beginning with gr. ¼, subcutaneously; for if the pa-

tient sleeps the movements cease. For the same purpose chloroform may be given, chiefly for this reason—that it is of the first importance that the patient should not become exhausted. In very severe cases the patient's limbs should be wrapped in cotton-wool, and, to prevent chafing, the sides of the bed should be raised and padded. As improvement begins, much good is to be obtained by regulated movements. These are best conducted by light gymnastic appliances, and to the sound of music. They should never be carried to the extent of exhaustion.

EPILEPSY.

Epilepsy or Falling Sickness is the name given to a somewhat complex group of symptoms, but the most important of these are sudden and complete loss of consciousness, for a longer or shorter period, usually accompanied by local or general muscular contraction of a convulsive character. The essential element is loss of consciousness, for, as already seen, the muscular contraction in cases of hysteria may closely simulate that of epilepsy, but in hysteria the consciousness is never completely lost. The insensibility and convulsions of epilepsy are to be distinguished from those of Bright's disease, or other forms of convulsion.

The most important predisposing cause to epilepsy is inherited taint, and this taint may be derived not only from epileptic parents, but also from ancestors prone to nervous diseases of various kinds. This is, if possible, more frequently the case among the rich than among the poor. It does not, however, follow that epileptic parents have invariably epileptic children. Sex has little influence on the appearance of epilepsy (rather more females than males suffer), but age has; rarely, indeed, does epilepsy begin after forty-five; most frequently it shows itself between the ages of ten and twenty, seldom between twenty and thirty; more frequently again about forty, or forty-five. These periods include the beginning and ending of sexual activity in females, and of greatest sexual activity in males also. The greater the inherited tendency the sooner does the evil manifest itself. The exact exciting cause of epilepsy is often difficult to make out, especially in the lower classes, whilst in the higher, whose

anxiety to hide any hereditary taint is great, trivial causes are assigned, to the exclusion of the real ones. Briefly, however, the causes might be grouped as physical, mental, and reflex:—physical, as from falls or blows; mental, as from fright, anxiety, and over-work; and reflex. as from pregnancy, dentition, masturbation, and the like. These are the most important. Neuromata, exostoses of the skull, changes in the brain coverings, or cerebral tumours, are important physical modes of causation. In most cases a history of predisposition, or of exciting cause, can be made out.

It is common to classify epileptic attacks into three groups:—(1) That characterized by only slight spasm, it may be only loss of consciousness; this is called in French idiom *le petit mal.* (2) The well-known epileptic seizure, with loss of consciousness and violent general convulsion—*le haut mal.* (3) Irregular or masked epileptic paroxysms.

Not infrequently the severer form of the disease begins as the slighter, the *petit mal.* The patient is busy in his ordinary way, when suddenly he loses himself for a moment, and is sometimes quite unaware that anything has occurred. The patient may stagger from epileptic vertigo, but does not fall. He may become pale or flushed—more commonly the former, and he may look blankly for a moment; but not one of these signs is absolutely necessary—there may be loss of consciousness only. In some cases there is a forewarning, and the patient tries to lie down, but he may continue such automatic muscular actions as are necessary for sitting or standing during the whole of his seizure. On recovery there is often dulness of apprehension: acts may be performed and subsequently forgotten or repudiated by their author in a short period.

In another degree *le petit mal* is accompanied by motor manifestations. The mouth is drawn to one side, the patient squints, or the head is forcibly drawn round. In other cases the muscles of some part, as of the chest, are rigid as in holding the breath. In all cases the spasm tends to rigidity—that is to say, it is not clonic or interrupted, but is continuous as long as the attack lasts. This is the more common variety of the *petit mal.*

The symptoms of the severe form of epilepsy—that which we most frequently see—are very different. In a confirmed epileptic, after more or less warning, which

may be absent altogether, the patient becomes unconscious, and falls sideways or backwards to the ground with a hoarse, disagreeable kind of cry. There is no selecting a spot where to fall, for the attack may occur in the most dangerous situations. All the muscles of the body are thrown into violent spasm, but most frequently the spasm is stronger on one side than the other, so that the body is bent to one side, or else backwards. The chest is fixed, so that no respiration goes on, and the face, at first pale, speedily becomes red, and finally blue, from obstruction to the return of the blood caused by fixation of the chest. For the same reason the wrist-pulse is weak, and the veins of the face and neck distended. The eyes are open and turned upwards or inwards; the pupils, too, are dilated, and the hands and feet cold. Presently the rigidity gives way, but this is followed by violent contraction and relaxation of the muscles coming on alternately, and constituting what is termed *clonic* spasm. The face is twisted into all shapes, the eyes roll, and the spasmodically protruded tongue is lacerated by the convulsed jaws. By these spasms the head and arms are beaten against the ground. The hands are clenched with the thumb in the palm, the breath comes in gusts, and there is foaming at the mouth; if the tongue be bitten, bloody in character. The pulse is laboured, and the surface covered with a cold sweat. Sometimes the sphincters give way in the attack, and fæces and urine are ejected. To this probably follows a remission: the patient lies quietly, but totally unconscious, and sometimes quite rigid, when again, from some slight cause, the paroxysm recurs, usually to follow the same course, and this may be repeated indefinitely, until at last the paroxysm does not recur, and consciousness begins to return. Still, however, the patient can with difficulty be roused; but if raised and made to move, he may be able to help himself along on his legs, if he has fallen down elsewhere, until he reaches his bed. Left alone, he falls into a deep semi-comatose sleep, from which he awakes with a complete loss of memory as to everything which has occurred since the beginning of the attack. There is usually dulness of comprehension and lassitude, or a feeling of soreness, for some time after a paroxysm.

Such is the common but by no means invariable history of an epileptic attack. To begin with the exceptions, the warning signs, commonly called "aura," may be entirely absent; when present they vary in character.

The term aura, when strictly limited, is usually applied to a creeping sensation gradually extending from the extremities, especially the arms, until it reaches a certain spot, when the patient becomes insensible. In other cases the warning is more mental; such may be an hallucination, a feeling of fear, with distressing pain, and the like. Often, if the true aura can be stopped, as by compressing the part, the epileptic paroxysm may be arrested. Another sign of the onset of the attack is what has been called the epileptic cry—sometimes a yell, sometimes a groan, just as the patient falls, and which is never repeated. During the attack the spasms affect every part, but especially the head—the rest of the body may be rigid. On recovering from the attack vomiting is frequent, especially if the attack has been induced, as it not unfrequently is, by an over-full meal.

In the intervals of the attacks an epileptic may be perfectly well, and often is a man of eminence; but in most cases, sooner or later, mental weakness manifests itself, and the great majority of epileptics become more or less mentally infirm. Perhaps the most frequent indication of this is a loss of memory, to which is often added dulness of apprehension: you cannot get your patient to understand your question, and when he does he has often forgotten how to answer it; hence arises the great difficulty in getting anything like an accurate history from the patient himself. The aspect of such patients is very characteristic; they have a dull, heavy look, and move slowly and uncertainly when told to do so, as if they imperfectly apprehended what was said to them, and had only imperfect command over their limbs. Headache is often complained of, so also is vertigo. Epileptic attacks can hardly ever be called periodic in the strict sense, but it is common enough to find them recurring once a day, once a week, every three weeks, or every month. Sometimes more than one attack may occur in one day.

The most troublesome class of epileptics are the insane epileptics, who may be either epileptics who have become insane, or insane individuals who show signs of epilepsy. In such the criminal propensities are strongly marked, and they are about the period of an epileptic attack often extremely dangerous, being urged on to deeds of violence by a hardly controllable impulse. At all times they are unreliable, and as during the intervals between attacks they may show little signs of aberration, they may be

allowed to go abroad. It is to this class that many of the purposeless murders we hear of are due.

The pathology of convulsions has been by some asserted to rest on contraction of the cerebral vessels and the consequent anæmia of the brain, and the same has been supposed to occur during the epileptic seizure; but this neither explains the cause of the onset of the malady, nor of its recurrence. A better notion is, that they are due to morbid explosions of nerve force, determined by some irritation of the grey matter of the brain. Many morbid conditions have been found associated with epilepsy, but none are constant.

The diagnosis of epilepsy is somewhat difficult. It has been already pointed out that convulsions are not essential to epilepsy, yet almost every form of convulsion has been mistaken for that malady.

Convulsions are commonly due to some ascertainable cause: in infants to teething, worms, indigestion, and the like. In infants epilepsy is rare; such forms of convulsions are common, and cease with the removal of the irritation. Insensibility, too, does not come on first, but last; spasm precedes it. The convulsions of Bright's disease are not easily distinguished from those of epilepsy, if the patient is picked up and brought to you without any history. A history of albuminuria with little dropsy, loss of sight, and slight puffiness of the eyelids will help; moreover, in uræmic convulsions there may be an ammoniacal smell of the breath, and the patient tends to pass from one fit into another for a long time, being perfectly insensible between the two. Convulsions from brain disease resemble those of epilepsy, but there is always something more—*i.e.*, the convulsions are not its only symptoms, nor even, it may be, the most important of them. The insensibility of epilepsy might be simulated by temporary syncope, due to other causes; such cases may not be readily distinguished except by the fact that faintness is not common in epilepsy. In all cases we should try to find out the exact cause of the faintness, which should guide us in our judgment.

Hysteria very closely resembles epilepsy if we look at the surface of things merely, but not otherwise. There is no complete loss of sensibility, and there is power of regulating movement; the tongue is never bitten, the pupils are not dilated, and there is no subsequent semi-comatose state; besides, the history is generally a sufficient guide. We must never forget that epilepsy may be simulated,

and that some make a living by so doing. These are easily detected. The policeman's test is a cruel, but effectual one; it consists in thrusting the thumb-nail under that of the supposed epileptic. But in such cases such a mode of distinction should be unnecessary.

Treatment.—When once the attack is fairly developed, we can only hinder the patient from hurting himself; any attempt at restraint beyond this is injurious. Something may be introduced between the teeth to prevent the tongue being bitten, and beneath the head and arms to avert injury from beating on the floor. If there is an aura of sufficient distinctness and length we may try to avert the paroxysm by stopping it; grasping, rubbing, or mechanical means may be used. After the paroxysm the patient should be allowed to sleep as long as he likes. Our hopes of mitigating the disease, therefore, must depend on the measures to be adopted in the intervals between the attacks. Of remedies, there is but one that we can thoroughly depend on, and even that sometimes fails us; that remedy is bromide of potassium or ammonium. One cause of its failure is insufficient dose. It should be given in not less than 10-grain doses to begin with, three times a day, and the quantity may be gradually increased to 20, 30, or even 60 grains, if necessary; it should be given in a bitter infusion, along with some stimulant, as ammonia or spirit of chloroform. By means of this remedy some have been effectually cured; some have recovered, but relapsed, after a longer or shorter period, on discontinuing the drug, the use of which had not been continued long enough; most have been benefited, but some not permanently. Strychnine and iron should follow up the use of the bromide, as should every means to increase the general health. The food should be digestible, and a well-ventilated bedroom is a great desideratum. The patient should sleep with the head and shoulders high, but this should be effected in a way compatible with perfect ventilation of the bed.

Many other remedies and modes of treatment have been proposed, in particular belladonna in large doses is highly praised, and bleeding at the back of the neck by leeches sometimes succeeds. Nitrate of silver, too, is sometimes a remedy of value.

In no case should an epileptic be allowed to lead an idle purposeless life. Some light employment is of the utmost service.

PARALYSIS AGITANS.

Paralysis agitans, better known in this country as Shaking Palsy, is most frequently a malady of advanced life. It consists of involuntary shaking movements of the head, hands, or other portions of the body, even when the patient desires to be at rest. At the same time the power of these parts is lessened, and there is a tendency to run rather than walk, without which it seems to the patient as if he would fall.

Senile paralysis agitans is usually of slow and insidious growth. The patient probably feels his arms growing weak and that they exhibit a tendency to shake on exertion, the tremors taking the form of short and quick supination and pronation. These occasional tremors become more frequent, and extend from one side to the other, or from the arm to the leg, but this more rarely. The tremors are very troublesome to the individual in carrying on his employment, if accuracy of movement be necessary in it. When the tremors extend to the legs these seem to become heavy and their movements uncertain, so that the patient has to look at them in walking, lest he stumble. Next the head becomes tremulous, and finally the whole body. The knees move from side to side, so as to knock against each other; the head also moves from side to side, whilst the jaws move vertically, so that the teeth chatter. The tongue is tremulous, moving in various directions. The muscles of the face, eyelids, and eyeballs are usually exempt from involuntary movement, as are those of swallowing and breathing till late on in the disease, when all parts are affected and the motion becomes convulsive and violent. Any excitement tends to bring on these attacks, or greatly aggravates them; so does passing from rest to movement. The involuntary movements at first cease during sleep, and supporting the hand and arm tends to allay them; but constantly keeping the hand in a position to give rest tends to produce deformity which might be mistaken for the effects of rheumatism. Alternating with the tremors we not unfrequently see cramps, sometimes of a very painful character. The electromotility of the muscles is diminished in the advanced form and sensation is perverted. Sometimes there is neuralgia of a severe kind in the affected parts, sometimes also a sensation of cold. The tendency to run (festinatio) is not

an invariable symptom. It is due to loss of equilibrium, the muscles of the back are no longer able to maintain the erect posture, and so the body bends forward when the patient tries to walk; this bending threatens to make him fall on his face, to avoid which he finds it necessary to run. At the same time the difficulty of moving his legs continues; he fears to fall, and so is impelled to run, though with short, shuffling steps, till he can hardly stop himself. If he can take long, regular strides he gets on pretty well, but this he can do only early in the disease. At the same time there is no dizziness; the danger of falling arises from loss of balance forwards, though cases have occurred where it was backwards.

When fully established, the universal tremors are most troublesome; the patient can do nothing; he has lost all control over his limbs, and the more he strives to guide them, the more he becomes unable to do so, and except in sleep he has few periods of repose. Occasionally the sick man seems to improve, but only to fall back again. In the last stage of the disorder the condition is still worse: the tremors occur sleeping as well as waking; he has to be fed by an attendant, and even then cannot swallow, except with difficulty; the mental powers are weakened, and he cannot articulate; the tremors become more and more severe, so as to shake the bed, till he sinks exhausted, sleep prevails over the tremors, and the patient finally rests.

Senile paralysis agitans seldom appears under sixty, seldom tends to improve, save for a time, and usually lasts for about ten years, if the patient is not carried off by some of the intercurrent maladies common at that age. There is, however, another form of paralysis agitans occurring in younger people, which is hardly so inveterate, though not much less so. This is sometimes called Charcots' paralysis, or, from the post-mortem appearances, multiple sclerosis of the brain and spinal cord. The tremors may be very violent, but they cease during sleep; the patient staggers in walking but he does not run. Then of course there are none of the signs of advanced age, and the movements have not that regularity seen in true shaking palsy. Some of the patients do well, others remain permanently affected. Occasionally only one part or member may be affected, as the tongue or arm. This malady is almost confined to the male sex, and the only distinct cause which can be assigned for its appearance is mental emotion. A con-

nexion with rheumatism has been noted. As to pathology, in many cases that is not made out; in others, the multiple scleroses, that is, the substitution of patches of connective tissue in the brain and spinal cord for nerve substance, have been noted, especially about the cerebral peduncles, pons, and medulla oblongata. In other cases there may be atrophy without sclerosis. In cases which recover, both are probably absent. The prognosis in senile paralysis is bad, in younger patients not necessarily so.

Treatment.—From what has already been said, the treatment can hardly fail to be unsatisfactory. The best results we have seen have been from strychnine and iron, but that amounted only to relief for a time and partial subsequent improvement. Excessive exertion and absolute rest are both to be shunned. Belladonna sometimes does good. Warm baths have done good; so too have shampooing and wet packing, but only for short periods. Interrupted electricity does no good; in the functional cases much may be hoped for with the continuous current assiduously used and of not too great intensity, especially if it should be tried early. It should be applied to the spine and to the affected limbs in the line of the chief nerves.

WASTING PALSY.

This malady, also known under the title of *progressive muscular atrophy*, is one which seems to attack the muscles directly and primarily—that is, without any antecedent motor or sensory nerve paralysis. It is a disease of adult life, but seldom attacks either the very young or the very old. Males are more liable to it than females, and when females are attacked, it is usually those whose employments have assimilated them to men. Inheritance seems to have something to do with its development. The individuals attacked have often been of robust build, and it often happens that the special muscles first attacked have been those employed in certain trades, as by shoemakers, seamstresses, and the like. Long continued use of these particular muscles, cold and damp to the surface, and injury and disease of the spine, are commonly accepted as the most efficient causes of the malady. When cold has given rise to the symptoms, there are often violent pains associated with the wasting of the muscles. The disease comes on gradually, though

the patient only discovers his complaint after it has fairly developed itself, so that its onset seems sudden. Most frequently the muscles of the upper extremities are first affected, particularly the ball of the thumb, though it may manifest itself in the foot, or some other portion of the hand or arm. It spreads gradually and irregularly: sometimes only certain sets of muscles are affected; in others the whole system is by degrees invaded, so that death may follow from implication of the respiratory muscles. The wasting of the muscles produces notable deformity, especially if the opposing set are unaffected, for then these continue to act whilst the wasted muscles have lost all power. The affected muscles also lose electro-motility, but (and this is a most important diagnostic) only in proportion to their wasting; as long as the tissue remains muscular, they respond in some degree; they are also frequently liable to irregular spasmodic motions of a fibrillar kind. At the same time the general health may be good as long as swallowing and breathing are unaffected.

Wasting palsy is a disease of slow growth, but it tends to progress, sometimes, however, stopping when a certain group of muscles has been affected, at others spreading to the whole body. Its advance is, however, intermittent, and it is often quite possible to restore the wasted muscles to a healthy state. The muscles themselves when wasted may be reduced to membranous filaments utterly irrecognisable as of muscular origin, or they may be completely fatty, but not much changed in bulk. The protoplasm of the fibrils is that which seems to alter first. The spinal cord shows signs of atrophy, and in the cord are found altered patches where the nerve tissue has been replaced by granular matter, especially in the grey substance and ganglia of the posterior nerve-roots. As the malady always seems to begin in the muscles—*i.e.*, the wasting comes before paralysis, the most probable source of the disease is some affection of the trophic nerve system.

Treatment.—If we knew more of the disease our treatment might be better, but as matters stand we can only be guided by experience. The health is to be looked after, and every precaution taken to secure the due fulfilment of all bodily functions. Strychine and iron may be given. Hot sulphur waters are strongly recommended as baths, but on the whole our reliance must be

on electricity. This seldom fails to do good, and may permanently arrest the malady. Faradisation is commonly employed, but the continuous current gives more hope of restoring nutrition. If there be much pain at night, a chloral draught or hypodermic injection of morphia should be given.

PSEUDO-MUSCULAR HYPERTROPHY.

In many ways allied to the wasting palsy just described is another form of diminished power, apparently as different from the wasting palsy as possible. In it there is a marked increase in the bulk of the affected limbs, but this is due to the development of connective tissue, whilst there is absolute muscular waste. The muscular tissue is pale and yellowish, owing to the presence of abundance of fatty molecules. The disease occurs in children, and the parents at first are immensely pleased with the fine calves the boys show, and wonder at their increasing weakness. The weakness does, however, advance rapidly till all power is lost. Electro-motility is not lost, and it is the use of the constant current which holds out the best hope of amendment.

Between the fibres connective and adipose tissue are developed.

GLOSSO-LARYNGEAL PARALYSIS.

The forms of paralysis originating in degeneration or other disease of the medulla oblongata are exceedingly varied, but one of the most marked of these is undoubtedly the disease known as labio-glosso laryngeal paralysis. This involves the root of the facial, the long or motor root of the trigeminus, the hypo-glossal, spinal accessory, and vagus. There is thus loss of power over the lips, tongue, jaws, muscles of mastication, soft palate, pharynx and larynx, together with quickened but weakened respiration and pulse, diminished temperature, loss of speech and power of swallowing. It is usually progressive in character, but not always; its chief interest rests on the peculiar grouping of symptoms.

Commonly the mischief begins gradually; the patient cannot pucker his mouth to whistle; the lips hang loose, and the saliva runs dense and ropy from the mouth; he cannot put the tongue out beyond the teeth, and he cannot move his jaws from side to side, so that chewing is impos-

sible; the soft palate is paralysed, and the food and drink return by the nostrils. Voice is lost, as expiratory power is diminished. Swallowing may be quite impossible, whilst the appetite remains perhaps unusually keen. A patient who was long under observation died from a large piece of beef which he was bolting, entering his trachea.

Such cases improve considerably with the use of electricity and with tonic treatment, but recovery is rare.

TETANUS.

Tetanus, commonly known as *lock-jaw*, from one of its symptoms, is more commonly met with as a surgical than as a medical malady. It is by far the most frequently produced by injury to some part of the body, especially the extremities, and is very often the result of wounds on the battle-field, especially if the wounded have been exposed to severe cold and damp after the action. This also gives the clue to some of those cases which occur spontaneously, for the disease is grouped into two divisions, *traumatic* and *idiopathic*. A form of the malady sometimes seen in newly-born infants is called *trismus infantum*. In very many respects strychnine poisoning is analogous to tetanus. The malady is most frequent in warm countries, perhaps because the nights are comparatively colder.

However induced, tetanus usually comes on with stiffness about the throat and neck, and a difficulty in chewing and swallowing. If asked to open his mouth, the patient can hardly separate the jaws far enough to protrude the tip of the tongue. The stiffness increases and the head is drawn back, but the rigidity soon extends to the trunk, and then the body is bent backwards like a bow; at the same time the muscles in front are rigid, so that the abdomen is hard and tense, like a deal board. This condition gives rise to a peculiar and characteristic pain in the pit of the stomach, which is very severe, especially in convulsive paroxysms; it is probably due to spasm of the diaphragm. After the trunk the lower extremities become affected, and in time the upper extremities, but these are seldom or never so severely involved as are the trunk and lower limbs. More rarely still are the muscles of the orbit involved in this malady, neither are the involuntary muscles, if we except the diaphragm, as already said. The rigidity of the trunk

muscles does not always incline the body backwards (*opisthotonos*), though this is the rule; sometimes the body is inclined to one side (*pleurosthotonos*), or even forward (*emprosthotonos*); neither are the muscles in a state of uniform rigidity. From time to time violent spasms seize the already stretched muscles, insomuch that their fibres are sometimes torn asunder, the teeth broken, and even the thigh-bones snapped across. At such times the body is arched, and rests only on the head and heels; the muscles of the face are contracted and give a peculiarly aged look to the individual. The nostrils are distended, and the angles of the mouth drawn upwards and outwards, in what has been termed the sardonic grin (*risus sardonicus*), whilst the tight lips leave the bare teeth exposed. These violent and painful paroxysms occur from time to time, and last from five minutes to an hour or more. They have also this characteristic feature—that the slamming of a door, a draught of cold air, or an attempt to move the patient, will bring them on. These facts tend to show that an exalted sensibility of the spinal cord is the essence of the mischief.

In all cases the temperature is raised, sometimes to a high point, even to 110° and 112° F. in fatal cases; but the skin is moist if hot, and the heat seems only the consequence of the excessive muscular contraction. At the same time the pulse is small, and the breathing greatly interfered with from rigidity of the respiratory muscles; this may be so great as to cause death, but in most instances it only suffices to give rise to exceeding great discomfort, which, together with the muscular pain, totally precludes sleep. Consciousness is unimpaired, and appetite too, may be, probably generally is, likewise good, so that the patient suffers from hunger and thirst which he cannot relieve, for any attempt to swallow, or pass the stomach-pump brings on spasm of the pharynx. The mouth is usually filled with a viscid mucus. Sooner or later, in most cases, death supervenes, brought about by want of breath or utter exhaustion, when the muscles promptly pass into the rigor mortis.

After death, if a wound exist, we may sometimes find the nerve-trunks leading to it swollen, red, and inflamed; but in other cases no such change is observable. We are, in point of fact, fain to refer the morbid condition to some change in the spinal cord, whereby its sensitiveness to ordinary impressions is greatly excited, and which tends

to convert these stimuli into motor acts. The cord sometimes presents certain marked changes, the exact nature of which we are hardly yet in a position to define, but which, at all events, are of the nature of degeneration.

The *treatment* of tetanus offers no great hope of success. Every kind of remedy has been tried and has failed, but some patients have recovered. It should, therefore, be our object to try to tide the patient over his perilous time, till his over-excited spinal cord has time to recover itself, when recovery may follow. To this end absolute quiet in a still, darkened room, with light bed-clothes, and a moderately warm atmosphere, should be observed. Noise of every kind is to be avoided. Warm baths have been attended with good results. Chloroform procures rest for a time, and morphia hypodermically may procure sleep, but nothing cures the disease—that must wear itself out. Two things have been well spoken of on theoretical grounds, these are extract of Calabar bean and Curare, both of which have been tried, and with both of them patients have recovered. But then it is equally true that with both patients have also died. Both admit of subcutaneous administration, which is a great point, for the ordinary modes of administration are hardly feasible. Even in successful cases it takes weeks to quiet the excitable nervous system and muscles.

DISEASES OF THE SPINAL CORD.

SPINAL MENINGITIS.

The coverings of the spinal cord, like other parts, are liable to inflammation. Very often these inflammatory attacks are due to injury, but sometimes, especially when prevalent in the epidemic form, may be due to totally different influences. This is especially the case with inflammation of the pia mater. This form of disease often begins with a chill, followed by pyrexia and severe pain in the back, greatly increased on pressure and on motion. These pains are not localized only, but also seem to be radiated along the extremities, indicating implication of the sensory nerve roots; whilst the affection of the motor roots and fibres is shown by spasm of the muscles of the back and limbs, which motion exacerbates. The muscles of respiration may be thus affected, and so death follow, but usually the malady ends fatally by the gradual development of paralysis from below upwards. In a more chronic form the peripheral pain, and the creeping paralysis may be the chief symptoms. Most frequently the malady is fatal, in one or other of the ways alluded to, or by the exhaustion of fever.

After death marks of extensive inflammation are usually found, the pia mater is thick and congested, sometimes covered with false membranes, or with copious purulent effusion into the sub-arachnoid space. The cord itself is not greatly altered. In the chronic form the fluid effused is watery and of varying amount.

Treatment.—In the acute form of this malady the old antiphlogistic remedies of bleeding and blistering still hold their own. The bleeding should be, however, entirely local, and the blistering should be such as not to exhaust the patient. The blisters are best used after the first onset of the malady has been subdued. It

is probable, however, that we have in ice a remedy more manageable and less objectionable than either leeches or cups. It should be freely applied. In its absence irrigation by cold water should be used. For this an india-rubber tube should be fitted and tied to the spine, its upper end dipping in a basin above the patient's level, its lower end in a basin below the bed. To the lower end should be fitted a pinchcock strong enough to resist a column of water the height of the spine, but not one the height of the basin. The basin being filled with water and the filled tube adjusted to it syphon-wise, a continually renewed stream of water may easily be kept up as long as is desirable. In more chronic forms hot baths and cold douches seem to promise well. Some patients do very well with certain hot mineral springs.

MYELITIS.

Myelitis, by which we mean inflammation of the substance of the spinal cord, is a somewhat obscure malady, especially in its chronic form. It most frequently follows injuries to the spine, but may occur spontaneously. By some it is assigned as the most frequent cause of paralyses following spinal curvature due to disease of the bones. It may follow wounds or blows, or be developed from no very apparent cause; for the causes commonly assigned are too trivial to merit the name. It is almost always associated with meningitis, but the symptoms arising from it are more localized to certain spots in the back, and paralysis is both an earlier, and more inveterate symptom, than in simple meningitis. Sometimes death is an early occurrence, especially if the respiratory centres and nerves are affected; should recovery take place, paraplegia remains behind.

The symptoms which arise from sub-acute and chronic myelitis are hardly definable, and often not very easy of description, since the two include all kinds of morbid changes, and an equally varying group of symptoms. There may be pain at one particular spot, increased on the application of heat, with diminished power of the parts below the level of this spot, gradually going on to paralysis. There is, first, disordered sensation; finally, anæsthesia; but the limbs sometimes remain preternaturally subject to reflex irritation, as shown by twitching and spasms. Such patients sometimes get well up to a

certain point, and then remain stationary for years. In others, the bladder paralysis and consequent urinary mischief, or the bed-sores on the paralysed parts, prove fatal; or intercurrent disease may carry the patient off.

In the acute form of the disease we find lesions of two forms. The nerve-tissue breaks down and softens, either throughout the whole thickness of the cord, or in its central parts only. In the former case, at certain spots, we find the tissues soft and pulpy, coloured with hæmatin. In the other we have the softening, say in one of the columns of the grey matter, extending for a considerable distance upwards and downwards, and not affecting other portions of the thickness of the cord. In the latter case, sections when made and washed look as if pierced by a pin-hole. Their nerve elements, in other parts, may be quite normal. In the more chronic forms there may be induration as well as softening, perhaps, following on it.

Treatment.—The treatment of myelitis and meningitis are much the same. The great thing is to prevent softening, and to this end cold should be assiduously applied. If averted, counter-irritation may be used to improve the condition of the cord, by clearing away effused products. To this end, gentle and long-continued counter-irritation, together with the use of the electric current, and Iodide of Potassium, with bark and cod-liver oil, promise better than remedies which are more violent and exhausting.

LOCOMOTOR ATAXY.

The malady now generally known as locomotor ataxy was, years ago, known as *tabes dorsalis*. This disease, which presents peculiar symptoms, easily recognised, is now known to depend on softening, or other form of degeneration of the posterior columns of the cord; and of the posterior nerve-roots. It is most frequent in middle life, and men are more prone to it than women. It has been asserted that the malady is generally due to sexual excesses, but this is far from being true. Sometimes it tends to become hereditary, but we are hardly in a position to go beyond such general causes as fatigue and exposure, as direct excitants. Possibly the malady ought to be described as loss of the muscular sense. This may be hardly intelligible to those who do not admit of the existence of such a sense; nevertheless, we are all familiar

with the fact that we know and can tell the exact position of each limb without looking at it. If we see an obstacle to be overcome in walking, we know what elevation of the foot is necessary to overcome it exactly. This power being lost, by whatever name called, we have locomotor ataxy. Other conditions may be superadded, especially loss of ordinary sensibility; but this seems the chief. Loss of co-ordinating power is also an element of prime importance. Often the first sign of this loss of co-ordinating power, or muscular sense, whichever we call it, is staggering when the patient gets out of bed in the dark. In other cases, there are severe attacks of pain, commonly described as tearing in character, referred to the lower limbs, long before any other sign of disease is observed. These pains are often considered to be rheumatic, but are, in truth, neuralgic. Patients, too, tire sooner—especially when walking, than they have been wont to do. But when seen, the patient has usually passed these earlier stages. We then usually find that he cannot stand upright with comfort, except he has his eyes fixed on some object to steady him; this is still more difficult if the feet are brought close together, and ultimately becomes quite impossible. If asked to walk, he fixes his eyes on some object, and throws his legs out in a vague kind of way, never knowing how high his feet are from the ground, and bringing his heels down with a bang, not knowing how near the ground they are. Asked to turn round sharply, very likely he falls down, if not supported. Ultimately, when supported by crutches or otherwise, and asked to walk, he throws out his legs in every direction. He has no knowledge of the position or condition of his muscles, and has no power of co-ordinating them for any special purpose. At the same time, there is no direct loss of power: the patient retains the power of executing simple movements, as thrusting with the feet, with nearly as great strength as in health; but combined movements he cannot execute. So, too, if his leg be bent, you cannot straighten it against his will; and, *vice versâ*, you cannot bend it if straight. Muscular power and motor nerve-power are not lost; the malady is due to disease of the sensory portion of the nervous system. For this reason, too, the neuralgic pains already referred to are a prominent symptom; generally, they are tearing, stabbing, or shooting in character, and affect mainly the lower part of the abdomen and lower extremities.

At the same time, there are usually other defects of sensation, such as numbness, pricking, and tingling. In some patients sensation is altogether lost; but it is usual, though not invariable, for a sense of heat and cold to persist when other forms of sensation have vanished. On the other hand, certain forms of the disease are ushered in by loss of this sense, so that patients are constantly burning their fingers without knowing it.

Nor are the nervous disorders limited to these. There is often loss of sight, and sometimes of hearing, whilst in some there is double vision, with or without squinting, and ptosis. The urinary organs are often involved; the patient has some difficulty in retaining his water; but this may be due to his not perceiving the fulness of his bladder, and there may be a similar difficulty with the bowels. Sexual power is not impaired in the early stage of the disorder, and there is little impairment of nutrition. Nevertheless, the malady almost invariably tends to progress, and sooner or later ends in death, but this may be deferred for many years. Commonly it follows on bed-sores, cystitis, or some intercurrent malady. After death the coverings of the cord posteriorly are usually found thickened, and if there be much atrophy we may expect the sub-arachnoid fluid to be increased in quantity. The cord near the posterior central fissure is soft and semi-translucent, the nerve-cells and fibres have disappeared, and the fine connective tissue of the part is increased and corpuscular. The posterior roots of the nerves are thin, cord-like, and mainly composed of connective tissue, especially low down in the cauda equina.

Treatment.—This, unfortunately, is not very satisfactory. The use of the constant current, and nitrate of silver have been mainly recommended, and apparently on good grounds, but the nature of the disease must be borne in mind: it is essentially a degeneration, very chronic, and tending to go from bad to worse. Such being the case, general measures may do more good if persisted in, but not carried to an excess. Among these, visits to certain foreign baths may be recommended. Chief among these are Wildbad, Gastein, and Pfäffers. Water-cure establishments were at one time greatly frequented by these patients, but the results were not gratifying, and except such treatment be carried out with judgment, it is more likely to do harm than good. Never-

theless, conducted on sound principles, we may expect some benefit from it. Strychnine, cod-liver oil, phosphorus, corrosive sublimate, and a host of other remedies have been recommended. They should at least be borne in mind, for the treatment must be persevering, and there is time to try many things. Rest for the diseased organs, and improvement of nutrition, should be the great objects aimed at.

DISEASES OF THE NERVES.

NEURITIS.

Inflammation of the substance of nerve-cords is not a common malady, and when it does occur inflammation of the neurilemma is much more common than inflammation of the nerve substance. Inflammation of the neurilemma gives rise to redness and swelling of nerve-trunks, with infiltration of the same with fluid, rarely purulent, though there may be pus in the connective tissue round the nerve. Very seldom the nerve-substance is affected; if so, it breaks down into a soft, blood-stained, pulpy mass. In the more chronic cases the nerve is at first thickened and softened; later, only connective tissue may be left behind Acute neuritis is always characterized by pain and tenderness along the course of a nerve, and is not easily distinguished from neuralgia. Tenderness over the diseased spot, and impairment of nerve power in the parts to which the nerve is distributed, may be the main symptoms enabling us to distinguish the two. In sensory nerves there is a feeling of tingling due to the inflammation, but referred to the periphery of the nerve, and later a complete anæsthesia. In motor nerves there is loss of control over the muscles, with twitching, or some other form of irregular motion. The sciatic and ulnar nerves seem most prone to inflammation, but gouty inflammation of other nerves may occur, and may do serious damage. Such a diathetic connexion must be borne in mind in treatment, as must the existence of syphilitic formations in connexion with nerves.

The *treatment* of neuritis will vary considerably with site. If the nerve be superficial, undoubtedly cupping and blistering do good; if deeper, we must try other remedies. Often opium and lead lotions relieve pain, or the subcutaneous use of morphia may be tried. Occasionally the actual cautery succeeds where other means of counter-irritation have been used. The use of colchicum, and the iodide of potassium in a certain number of cases should not be overlooked.

NEUROMA.

By neuroma we strictly imply a tumour composed of nerve elements, but such are very rare; most neuromata originate from the connective tissue sheaths of the nerve filaments. They are firm, elastic tumours seated in the subcutaneous connective tissue, having the skin readily moveable over them. They are commonly found singly, are about the size of a pea, and are characterized by violent attacks of pain, coming on in paroxysms, and extending to the peripheral distribution of the nerve. Pressure always aggravates the pain to a marked degree, but the attacks may be brought on by much slighter causes, as mental disturbance, or even atmospheric changes. Sometimes the attacks occur during sleep. The functions of the nerve beyond the tumour are usually, as in neuritis, especially if the tumour be large, somewhat impaired, but the chief characteristic of such growths is the severe pain to which they may and do give rise. Fortunately their cure is easy—we can cut them out.

NEURALGIA.

The term neuralgia has been applied to all sorts of painful disorders, and has been a kind of waste place in medicine where all kinds of dry rubbish might be disposed of. Essentially, neuralgia is a painful affection of a sensory nerve, intermittent and often peculiar in character, but attended with no local sign of mischief, tenderness or otherwise, and unaccompanied by fever. In chronic cases such a definition does not exactly hold good, for there is often local tenderness, with alterations of nutrition in the neighbourhood of the painful spot.

Neuralgia commonly occurs in weakly, delicate persons, or in persons who not being such normally, have passed through some exhausting affection, mental or bodily, leaving their nervous systems in a prostrate condition. Some forms of neuralgia have their origin in direct injury to the nerve itself, as in blows or wounds, the complete division of the nerve being less commonly followed by this painful condition than a partial severance only. Foreign bodies which have remained in the flesh after the wound which they caused has healed up, are potent

causes of neuralgia, as are the neuromata or other tumours, syphilitic or otherwise, growing close to a nerve; in short, anything which will produce pressure on a nerve, if acting over a considerable period, is liable to excite neuralgia. One special cause must never be forgotten, though its mode of action is utterly obscure—that is, malaria, especially developing itself in the form of brow ague.

There are certain general symptoms common to all neuralgias; these are, the pain, mostly, as already described, intermittent, and spreading along the peripheral course of the nerve; also certain painful spots in the course of the nerve, commonly where it issues from a bony canal or a tense fascia, here also there is great tenderness on pressure; and an interference with nutrition, as exemplified in watering at the eyes and nose, herpes, and in long continued cases by atrophy. But there are many special forms, each characterized by special symptoms.

Chief among these is neuralgia of the trigeminus, or some part of it, commonly called *tic*, or *tic-douloureux*. Not every part of the nerve is affected, but certain special points are commonly attacked; these, it has been said, are especially the branches which pass through narrow canals or openings, but this is a rough criterion. Supra-orbital and parietal neuralgia is one of the most frequent forms; this, when associated with pain in certain other branches of the ophthalmic division of the fifth, constitutes the true *hemicrania*, *migraine*, or *sick-headache*, a purely neuralgic affection, independent of disturbance of the stomach. This affection often begins in youth and extends over years, occurring from time to time, especially after severe mental exertion. It often begins with ocular spectra and loss of vision over a certain area of the eye, the outline of the spectrum resembling the outline of a fortified town, and often being coloured rainbow fashion. The patient feels ill at ease, qualmish, inclined to gape, and is incapable of much exertion; rest and quiet are eagerly sought, but give no particular relief. The pain, which usually affects one side of the forehead, the eyeball, and the eyebrow, is dull and sickening; the mouth is clammy, and there is some thirst, but swallowing fluids only increases the nausea, which commonly ends in vomiting. The pulse is slow, and the eyeballs seem to beat synchronously with it, sometimes all the vessels in the head seem to pulsate, and this painful feeling is greatly aggravated by the act of vomiting. After vomiting, but not on account of it, for the same happens without any vomiting, the patient begins to

feel quieter and gradually drops off to sleep, waking free from pain, but exceedingly shaky and prostrate.

Another very common and violent form of trigeminal neuralgia is that known as *tic* or *face-ache*. This may occur at any period of life, but is most common in middle age, especially after worry and fatigue, and exposure to cold. In some the attacks only come on after forty, and are then very violent and unmanageable. This form of neuralgia may be said to correspond mainly to the distribution of the second division of the trigeminus, just as the former did with its first, but adjoining filaments of the latter may also be involved, especially in the parietal region. Neuralgia of the lower division of the fifth is comparatively rare, except in the form of toothache. In all forms of face-ache there is a great tendency to the formation of tender spots, and to muscular twitchings, the result, but not directly, of the pain, for they are under the control of the will, but purely reflex. The pain in these cases is unusually severe, comes on very suddenly, and is very intractable. Often the patient has tooth after tooth removed in the vain hope of alleviating his sufferings, which seem unbearable, but the desired result is not thus attained.

The next group of neuralgias, according to the classification ordinarily adopted (Valleix's) is that called from the nerves involved *cervico-occipital*. It is not so common as facial neuralgia, but when it occurs is often very severe, though not so bad as the former. Most frequently it follows exposure to cold, and is accompanied by tender spots. It tends to spread forwards towards the lower part of the face as well as upwards on to the occiput. *Cervico-brachial* neuralgia is an affection of the brachial plexus and its branches in the upper extremity. The posterior as well as the anterior branches of the lower cervical nerves are involved. From the frequent anastomoses of the nerve-trunks in this plexus and its offsets, many painful spots are usually produced, the course of the ulnar nerve being most frequently followed, and disturbances of nutrition are often seen associated with them. One great cause of this form of neuralgia is direct injury to the nerves, by cutting, bruising, or pressure from various causes to which the parts are greatly exposed.

Intercostal neuralgia, or dorso-intercostal neuralgia, is the same kind of affection attacking the dorsal nerves. Here, too, we have pain and painful spots. The latter arise close to where the nerves appear, where they divide, and

where they come to the surface near the sternum. The nerves most frequently implicated are the seventh and eighth, sometimes with the sixth or ninth. The reason assigned for this has been the liability of their roots to pressure from the venous plexus ending in the azygos vein. This more than any other form of neuralgia tends to be associated with herpes, generally unilateral. This variety of neuralgia is frequent in women, especially under the left breast. The pain is to be distinguished from the pain of exhausted muscles, which may be called myalgia. It constitutes the malady formerly known as pleurodynia, as well as what has been known as mastodynia, or painful breast in the female.

The next neuralgic group of nerves are those of the lower dorsal and lumbar regions, which extend from the back round towards the abdomen, and downwards to the scrotum and testes. The most common form of the malady here is that called *lumbago*, some of the neuralgic affections of the sexual organs in women, and the exceedingly painful neuralgia of the testes in men. The last form of neuralgia (with the exception of neuralgia of internal organs, as yet little understood), and one of the most common forms of the disease is that affecting the lower part of the lumbar and upper sacral nerves and their branches, constituting the well-known disease *sciatica*. This form of neuralgia is rare in young people; but it generally attacks males under forty. The pain is never absent after it fairly begins, though it may be slight at first, and it is always very obstinate. The pain, though commonly assigned to the spot where the sciatic emerges from the pelvis, may affect any of the cutaneous nerves in that region, and may extend downwards chiefly by the peroneal nerve to the dorsum of the foot. The motor functions of the great sciatic are often affected as well as the sensory, so that in some cases there is a kind of paralysis, but in some also spasm or cramp of particular muscles. Nutrition is not so frequently affected in this as in other forms of neuralgia, but there is often seen a certain degree of hyperæsthesia, as well as of a kind of anæsthesia as far as *tactile* sensibility is concerned. In all cases of sciatica the pain is obstinate and liable to be aggravated by any movement which will occasion pressure on the nerve affected—even coughing or sneezing may give rise to pain.

The internal varieties of neuralgia can hardly be spoken of with any degree of accuracy, but they have been described in accordance with the principal plexiform dis-

tributions of nerves found, especially in the thorax and abdomen. Angina pectoris has in some cases been described as a neuralgia.

Treatment.—In most cases of neuralgia the patient is below par, and so restorative remedies are those which promise best as a basis to work upon. Foremost among such remedies are cod-liver oil and carbonate of iron, the latter in somewhat large doses as saccharated carbonate, or mistura ferri. Neurine tonics, commonly so called, as zinc, whether sulphate or valerianate, and strychnine, are less useful. The salts of quinine and arsenic are often of good service, especially when there is a malarial origin for the malady, but these are not the majority of cases. Quinine is especially useful in brow-ague, and arsenic when the neuralgia takes the form of angina pectoris. In some patients of an unmistakably syphilitic, rheumatic, or gouty tendency iodide of potassium in five to forty-grain doses, and in the last case vinum colchici in ten-minim doses do great good, but certainly not in ordinary cases. In these, too, warm baths, especially of the sulphurous and alkaline class, are often of great service. In many cases, especially when the affected nerve is near the surface, nothing does so much good as blistering; but here, as in other cases, it is by no means necessary to raise the cuticle to acquire the full benefit. An hour or two's application of the blister followed by a hot poultice, will be quite sufficient, instead of the twelve hours ordinarily recommended. If these means do not suffice, the dusting of a little morphia, say gr. $\frac{1}{4}$, on the raw surface, will often do good; but in others, especially when the pain is deep-seated, nothing answers so well as hypodermic injection of the same remedy (morphiæ acetatis gr. $\frac{1}{4}$) dissolved in five minims of water with the aid of acetic acid, and as nearly as possible neutral. Atropia may be used in the same way; dose $\frac{1}{60}$ gr. In some forms of neuralgia especially affecting the head, chloride of ammonium in 60 gr. doses, does great good, in others it fails altogether; it is often entirely inactive in smaller quantities. Recently the use of the constant and continuous currents of electricity has come into fashion, undoubtedly in some instances with great success, but it requires judgment in its management. In sick headache the value of strong tea or coffee and guarana is often striking, whilst oil of turpentine is highly spoken of in sciatica. Division of the painful nerve is sometimes successful.

FACIAL AND OTHER FORMS OF SPASM.

This morbid condition, also known as *tic convulsif*, is due to an unnatural irritability of the facial nerve. The branches going to the stylo-hyoid and digastric muscles are unaffected. It seems to arise from a variety of causes, exposure to cold among the number. The spasm usually affects one side only, and is usually clonic; this side is at first painful. Besides pain, rapidly succeeding grimaces, or winking are the most marked phenomena. When the spasm is continuous instead of intermittent, we may have rigid closure of the eyelid (*blepharospasm*), or that drawing up of the angle of the mouth known as the *risus sardonicus*.

When the spinal accessory on one side is affected in the same way, we have twisting of the head (*torticollis*) to that side from spasm of the sterno-mastoid and trapezius. These spasms may be clonic; and the head may be drawn downwards to the side, and either forwards or backwards, according to the muscles most affected. In children we sometimes see both sterno-mastoids affected, and then the head is made to nod in an absurd-looking way. This constitutes the so-called *Salaam* convulsion.

Permanent rigidity of the sterno-mastoids on one side is sometimes developed. Then the head inclines forwards and to one side, and the shoulder is drawn up, so that even spinal curvature and falling in of the chest, especially if the affection come on early in life, may result.

The *treatment* of these conditions is very unsatisfactory. Clonic spasm is best dealt with by the constant current, and strengthening remedies, especially strychnine and iron. Large doses of the succus conii sometimes do good. Sometimes, especially in the tonic form of spasm, division of the muscle is followed by good results, but in others it fails.

WRITERS' CRAMP.

This disease, also known as Scriveners' Palsy, obtains its name from the occupation which seems most frequently to give rise to its symptoms. These are violent spasms of certain muscles whenever the individual attempts to perform certain acts which seem to have given rise to the disease. Such spasms may occur in others besides

those much engaged in writing, especially in musicians and artists, but the spasm is always limited to any attempt at performing the peculiar movements required of each. It comes on slowly, first by a difficulty in performing the accustomed task, as if from weariness and fatigue. Thus in writing the pen requires to be guided more carefully and held more firmly than usual, whilst the musician sometimes involuntarily forms the wrong notes. This increases until when the patient attempts to perform the offending act, his hand involuntarily starts away, and the performance of the action becomes impossible. Nevertheless, he may be able to perform acts, requiring the greatest delicacy of touch, other than the particular one which has given rise to the cramp. Too frequently, however, the patient's bread depends on this one kind of performance, and he struggles to obtain mastery over his vagaries of movement until he finds all such efforts worse than useless. Usually cessation from the attempt is followed by cessation of spasm, but this is not always so. There may be other forms of spasm, and abnormal sensations in the affected parts, and tender spots are not uncommon. Sometimes too there is decided weakness of the limb, but this is rare. The disease is most common in males of middle age, and though in some cases there has been over-exertion and over-anxiety previous to the onset of the disease, this has been by no means invariably the case. As to its pathology nothing can be said. It most nearly approaches chorea and torticollis in character, but differs in this respect, that it only interferes with movements the result of education, not with those which are natural. The disease is sometimes, as indicated above, called a palsy, but it is to be carefully distinguished from paralysis of the extremities, whether of a wasting nature, or dependent on mineral poisons, as lead or mercury.

Treatment.—Rest from the peculiar avocation which has occasioned the malady is *indispensable*. Without that, the patient will never get well, and as sooner or latter he is incapacitated from following his occupation, the sooner he turns his thoughts to something else the better. It by no means follows that the patient must be idle: he may try any occupation where the peculiar offending motion does not occur, but to that extent he must obey the dictates of his disease. With early rest too there is hope of the complete departure of the malady,

so that the patient may be able to return to his avocations, and this to many is of very great importance. If, however, he persists too long, any such degree of relief is not to be hoped for. The general health of these patients is usually good. Some are anæmic from want of food, being partially incapacitated from labour by their malady, as in the case of lawyers' clerks. These require food and tonics as well as rest. Strychnine does some good, so too does the continuous galvanic current, cold douches, shampooing, &c., but early rest is the grand remedy. Later, regulated movements are valuable.

PERIPHERAL PARALYSIS.

Peripheral paralysis may affect either motion, sensation, or both; thus if a patient falls asleep with the hand hanging over a chair, very probably when he awakens the nerve-power may have vanished, and the arm be useless, owing to pressure on some of the main nerve-trunks for the time being. The same may follow pressure on a nerve by an aneurism or other tumour. This is especially the case with the recurrent laryngeals.

Another characteristic form of palsy of this kind has been called Bell's palsy, or paralysis of the portio dura. This usually affects one side of the face only, and in it all wrinkles, however old the patient may be, are in a sense wiped out. The patient cannot wink, and the eyelids are permanently open, owing to paralysis of the orbicularis and continued action of the levator palpebræ. He cannot frown, and the tears are not conducted to the nasal duct. There is no power over the nostril as in sniffing, the cheek puffs out in expiration, the patient cannot purse his mouth, and so cannot whistle or spit. In chewing the morsel turns over to the affected side and distends the paralysed cheek, whilst from the depressed angle of the mouth the saliva dribbles, and the patient cannot pronounce labial letters. Any emotion which ordinarily involves movement of the face, affects only one side, whilst the other is motionless, and if the palsy be double, all expression of emotion is impossible, so that the patient seems to live behind a mask. All these signs depend on palsy of the portio dura on one or both sides, sometimes the result of exposure to cold, sometimes of disease of the temporal bone acting on the nerve as it passes through the Fallo-

pian canal; though it may be due to central disease. Roughly the diagnosis of peripheral from central paralysis of a motor nerve may be said to be this—that whereas in central disease the paralysed muscles respond promptly to induced electricity (Faradisation), in peripheral palsy they do not, though they may to the continuous current when opened or closed. In rheumatic paralysis hot baths, especially of natural sulphurous, or alkaline mineral waters and iodide of potassium are the great remedies. The constant and continuous current of electricity generated by any of the ordinary continuous current batteries (Muirhead's, Stöhrer's, Weiss's, or Mayer & Meltzer's) is of the greatest possible service, whilst the interrupted current serves to keep up the nourishment of the affected muscles, especially if early employed. Strychnine is not of much use.

INFANTILE PARALYSIS.

This very peculiar malady, the nature and origin of which are alike obscure, only occurs in early life, generally between the sixth month and third year. There is no special liability to it on the part of healthy or of weakly children. It may come on with fever, sometimes like meningitis, or with convulsions. In all cases the member affected (most frequently one or both of the lower limbs, or a hand, but never the arm and leg on the same side) becomes entirely and sometimes suddenly useless. This may pass away, or it may become permanent. The bladder and rectum are never affected. If the paralysis be permanent, the limbs shrink in every way, and deformity from contraction as well as from the paralysis commonly follows, for the unaffected muscles have no counteracting force opposed to them. In the early stage electric contractility in the muscles remains, especially to the interrupted continuous current, but this soon vanishes and ultimately is entirely lost, even before muscle degeneration has gone to the length of absolute loss of power; thus tending to show that the paralysis is of a peripheral kind. The health of the patients may be perfectly good, and in other respects they may be quite vigorous, but the palsied limb hangs stunted and useless, or is fixed in some unnatural attitude.

Treatment.—In the early stage nothing does so much good after the feverish condition has passed away, as the

continuous current of electricity; but when nerve and muscle have both degenerated, the only thing we can do is to alleviate the general condition, especially by dividing contracted muscles, and so allowing the limbs to get as nearly as possible into their normal position.

ANÆSTHESIA.

Anæsthesia is the opposite condition from neuralgia, and is commonly included in the idea of paralysis. It may depend on either central or peripheral lesions; central when the sensory ganglia of the brain are impaired, peripheral when the conducting organs are at fault, though the change in the nerve may not be of a very marked kind as far as structural appearances go. Sensation may for a time be completely extinguished by the use of cold with perfect recovery, as in the anæsthesia produced by the ether spray. But again anæsthesia may depend on tangible change, such as fatty degeneration from whatever cause. One peculiar form of anæsthesia, which consists in insensibility to painful impressions only, goes by the name of *analgesia*. In other instances there is loss of the *sense of temperature*, so that the patient, knowing that he touches an object, does not know whether it is hot or cold, insomuch that burns frequently follow. In yet another form there is *pain* as well as anæsthesia. Thus if a tumour press on a nerve the consequence may be extinction of power or sensation in the part supplied by the nerve; but the pressure may be great enough to produce irritation and so pain, which in accordance with the usual rule, is referred to the distribution of the nerve and not to the irritated spot. With anæsthesia there is usually perverted nutrition, so that the parts are more easily acted on by pressure, heat, and the like, giving rise to sores sadly disinclined to heal. This last arises from interference with those nerve fibres which are termed trophic.

One of the most characteristic varieties of anæsthesia is that which affects the trigeminus, sometimes the result of pressure by a syphilitic tumour, or diseased bone. Here there is loss of sensation in the eyeball, the nasal cavity, the mouth and tongue all on one side, as well as paralysis of the muscles of mastication on that side. There are also perversions of nutrition: the eyes look rheumy, there is a

discharge of mucus from the nose and mouth, and, above all, if the internal divisions of the ophthalmic be affected, either alone or together with other portions of the nerve, inflammation and destruction of the eyeball may follow. Of course there is loss of sensation on one side of the face, best manifested in the lips, where any object applied to them seems broken from being felt on one side only. There is also loss of taste on that side. All this happens if the nerve be completely paralysed, but if only partially then the signs will vary with the part of the nerve affected and the degree to which it is affected.

Treatment.—In anæsthesia dependent on direct pressure on a sensory nerve there is only one remedy—removal of the compression. This is often impossible, especially when the compressing body is a malignant new growth, but in a goodly number it depends on a syphilitic deposit, and these are readily amenable to the influence of iodide of potassium in large doses of thirty or more grains three times a day. When the change is more molecular, the use of the continuous current of electricity is of the utmost value.

GENERAL DISEASES.

(A).—DISEASES CONNECTED WITH NUTRITION, ETC. ETC.

In a healthy body supply and waste are as nearly as possible equally balanced. But this healthy nutrition is liable to be unbalanced by a variety of circumstances which, if persistent, lead to disease. The want of food leading to direct death from starvation is the least frequent result. The forms of disease we see rather arise from a diet somewhat deficient in quantity, but more deficient in quality. If to diseases thus originating we add, as logically we ought, those arising from imperfect maintenance of bodily heat, and respiration of impure air, we have a tolerably well-defined group of maladies, most of which affect the whole system, but some of which attack certain special organs in an especial manner.

CORPULENCE.

The excessive use of certain kinds of food, especially fatty, and starchy or saccharine, coupled with want of exercise, leads to obesity, which may sometimes be distressing. A dietary, called from its inventor Bantingism, has been employed to get rid of the superfluous fat, but the plan enjoined must be pursued with caution, as evil results have followed its too indiscriminate application. The principles are these: to limit the diet as much as possible to lean meat of any kind; pork is generally objectionable in any shape; to eat no potatoes or rice, and to use only a little bread, either toasted or in the form of rusks. Light wines and dry wines are allowable, so is well-fermented bitter beer, in small quantity. All the rest of the alcoholic liquors are to be excluded, and those mentioned above used in great moderation. No butter or sugar is to be used; hence also most forms of

pastry are forbidden. Tea is to be taken without milk or sugar; and fresh and wholesome fruit may be consumed in moderation. Dry fruit is excluded. Moderate exercise must be taken, but all violent efforts are objectionable. In this way, and with time, corpulence may be decidedly reduced, but except the system be persevered in, is apt to return. Such a course is a serious interference with a man's mode of life, and should not be lightly undertaken, especially by those somewhat advanced in years. A much less rigid dietary will be all these can bear with impunity.

SCORBUTUS, OR SCURVY.

Want of proper food invariably aggravates prevailing maladies and gives rise to some special form of disease. Chief among these is *Scorbutus* or *Scurvy*, which was at one time the scourge of our fleets and armies, so as to more than once render important expeditions abortive. This malady is now little known and seldom seen in this country except in hospitals in seaports, to which sailors suffering from it are still occasionally admitted. Another form of malady allied in causation to the former—viz., *purpura*, may be developed under similar conditions on land.

The chief cause of scurvy is undoubtedly an insufficient diet. The food may be abundant and good of its kind, but if there is not a sufficient variety, especially of fresh meat and vegetables, sooner or later scurvy ensues. If besides being deficient in quality, the food is insufficient in quantity, and if with such a diet the individual be called upon to undergo severe labour and exposure to cold and damp under mental depression, the disease will all the sooner manifest itself, for these are powerful predisposing causes. Salted provisions were at one time looked upon as the main cause of scurvy, but though these are less nutritious than fresh meat, the essential cause seems rather to be the want of fresh meat and vegetables, especially of the green kind, or a combination of conditions not readily determined.

The earliest indications of scurvy are a general weariness and depression of spirits, wandering pains, apparently rheumatic, and especially a heaviness in the legs and feet, together with an inability for prolonged exertion. The colour of the skin becomes altered, especially the face,

which is of a pale, dusky hue and is inclined to be puffy. The mucous membranes are livid. The gums become swollen, tender, spongy, and fungus-like; they are purple in colour and bleed on the slightest pressure. The teeth are loose, and the breath is fœtid. At the same time there is a tendency to bleed elsewhere: the slightest injury to the skin causes a large bruise, and extravasations of various sizes form where there has been no injury done to the parts. In this way the whole lower extremities, which first show signs of the mischief, are discovered swollen, and exceedingly painful. They are as hard as a board, from effusion of blood between the muscles, giving rise to complete inability to move them. Ulcers, beginning as discoloured blebs, or following the slightest injury, form. These ulcers readily bleed and refuse to heal. Old cicatrices give way, and sores form in their stead. There may be profuse, hæmorrhage from the bowels, and other orifices of the body, especially the nose, mouth, and vagina, and effusion of blood serum into most of the cavities. The weakness is pitiful: attempting to sit up, causes fainting. The patients, if not relieved, sink under diarrhœa or dysentery; or dropsy, more or less suddenly developed, carries them off.

The pathology of this disease tends to shows that it is essentially a blood change. The red corpuscles are deficient in point of number, and the liquor sanguinis has also undergone material alterations, but what these are we are unable to say exactly, most observations on scurvy being antecedent to the period of exact physiological chemistry. Certain views generally prevalent, such as the malady being due to a deficiency of potash salts, are entirely hypothetical. We can only be certain of the existence of bloody effusions, solid or fluid, of tissues stained with altered blood, and of the thinness and uncoagulated condition of that fluid.

The diagnosis of scurvy is not difficult; it is only likely to be confounded with purpura. It is, however, of the very utmost importance to recognise the scorbutic tendency in patients afflicted with other maladies, as such complication adds greatly to the gravity of the disease and needs careful treatment.

Treatment.—Scurvy is a preventible malady and should not occur. To this end ships should be supplied with good sound provisions, including a due proportion of fresh tinned meats and vegetables. Lime or lemon-juice must also be carried, and should be distributed regularly

on a long voyage. Two ounces twice a week is the quantity usually given. Its distribution should commence not later than a fortnight after the ship has gone to sea. The juice should have spirit added to make it keep. Oranges, shaddocks, greens, potatoes, onions, carrots, radishes, sorrel, watercress, and, in short, the whole group of cruciferous plants, are useful in scurvy. Milk, raw eggs, and the juice of fresh meat are of the greatest service. Stimulants are necessary. Cider and spruce beer are good beverages, and beer-yeast, when obtainable, is highly commended. Next in importance to food is clothing and a warm dwelling; damp forecastles have had much to do with the development of scurvy in times gone by. As far as medicines are concerned, in scurvy they are merely auxiliaries to proper food. Iron, in the form of perchloride, is the best. It must be given in good large doses (ʒss every four hours), and will tend to check hæmorrhage and strengthen the gums. For this last purpose and for diarrhœa, alum along with iron is useful. Experience is against the value of citrate of potash, except in the form of lime or lemon-juice. To the spongy gums glycerine of tannin may be applied, and the same acid or gallic acid may be given for hæmorrhage by the bowels. Iron is, however, better. For the local changes, rest, with warm flannel, or slightly stimulant lotions, suit best at first, afterwards gentle rubbing with an embrocation containing turpentine, camphor, or the like, will favour absorption and free the muscles. For the raw gums nothing is so grateful as a good rub with the solid nitrate of silver every other day, with astringents, especially iron-alum, between. Condy's fluid and water is the best remedy for the fœtor of the breath.

PURPURA—THE PURPLES.

Purpura has sometimes been termed land scurvy, but it differs from scurvy in many ways, especially in this—that the mouth is not affected, and there is no tendency to the separation of old fractures and the like. It is probable that more than one form of disease is included under the name purpura. Sometimes purpura presents a tendency to hæmorrhage into serous cavities, as the peritoneum and pleura. Extravasations also appear beneath the skin and mucous membranes, or even on their sur-

face. The malady is not to be confounded with hæmophilia—*i.e.*, the hæmorrhagic diathesis. True land scurvy sometimes occurs among navvies, especially if at work where the supply of food is limited in variety. It has also appeared in workhouses and prisons from similar causes. But it is probable that as a malady purpura may be associated with more than one debilitating condition.

Purpura is sometimes divided into two varieties—(*a*) Simple, and (*b*) Hæmorrhagic; the latter being characterized by bleeding from a mucous surface.

In purpura the face is sallow or dusky, and the patient looks out of health. There is much languor and debility, mental depression, bad appetite, and a tendency to bleed at various parts, especially the nose, the stomach, bowels, and kidneys. Presently purple spots appear on the lower extremities and afterwards in other portions of the body. These gradually fade away, leaving a faint yellow tinge. There is pain in the muscles and neighbourhood of joints, especially on motion. There is sometimes a tendency to hæmorrhage into other parts, as the lungs or brain, and this constitutes the great danger of the malady as such, for in this way death may be brought about. Sometimes purpura is allied with amyloid change.

The *treatment* of purpura will depend on its cause, but as a preliminary measure it is highly desirable to clear out the bowels, especially if there is reason to think we have congestion of the liver, or blood in the bowels to deal with. This is best done by sulphate of magnesia (℥ij) with a little dilute sulphuric acid, or castor-oil. After this oil of turpentine in small doses (♏ 15) has been recommended, or tincture of larch-bark, in like quantity, may be given in its stead. Iron should always be given with the food, or in the intervals between meals; if with food, reduced iron or the phosphate should be given; between meals the liq. ferri perchloridi in ♏ 20 doses along with quinine and nitro-hydrochloric acid. For the bleeding a mixture of gallic acid and dilute or aromatic sulphuric acid often does good. The food must be nutritious and carefully selected. Stimulants are necessary as a rule, and the clothing and lodging should be seen to. Rest, too, should be enjoined, especially if bleeding has lasted any time.

ERGOTISM.

Closely allied to the conditions arising from insufficient food is that produced by one special kind of food—viz., diseased rye. This malady is seldom or never seen in this country, but occurs in parts where rye is used as food, especially after cold and wet seasons. Rye and other kinds of grain are liable to be attacked by a fungus, and ergot, or "spurred" rye, has long been known as a drug useful in promoting the contractions of the uterus in child-bearing. This is due to its power of causing contraction of unstriped muscular fibres, and as the same exist in the smaller arteries throughout the body, it also exercises an influence on these, contracting them and reducing their calibre. This, if carried to an extreme, ends in gangrene of the parts remote from the centre of circulation; the parts, after being for some time red and inflamed-looking, though cold to the touch, become black and dry and completely dead. Sometimes they fall off, or have to be removed by art. In other cases the symptoms are of a nervous kind, there being repeated contractions of various parts of the body, with violent pain, copious sweat, and a tendency to coma. Epileptiform convulsions are, however, more frequent.

The *treatment* of such a form of disease consists in at once removing the cause of the disease—viz., the unwholesome rye bread, and the substitution of a more nutritious diet. The alimentary canal should be well cleared out by saline purgatives, and tonics and stimulants be freely employed. The parts threatened with gangrene should be carefully protected by coverings of cotton-wool, and if gangrene has fairly commenced it is a question whether the part should not be at once removed. At all events this should be done as soon as a line of demarcation has formed. In this way the patient is spared much suffering.

FAMINE FEVER.

Another form of disease associated with insufficient and imperfect food is the disease called, from the evil which it accompanies, *Famine Fever*. It is also known by other names, as Relapsing Fever, and under this title

will be discussed among those maladies with which it is allied in symptomatology—viz., the Continued Fevers. It is, however, unmistakably a distinct form of disease, and only manifests itself from time to time, especially during scarcity.

ALCOHOLISM.

We have practically to deal with alcoholism in three forms: (*a*) acute poisoning by alcohol; (*b*) chronic poisoning by alcohol; (*c*) delirium tremens. In all except the first we have to deal with a condition of malnutrition as well as of poisoning, and it is this condition which seems to constitute the great danger of the malady.

Acute poisoning by alcohol is most frequently seen when people have had sudden access to abundance of spirits, as when a spirit cask has burst, or been stealthily tapped, or in drinking wagers. In these cases the patients instead of being flushed are deadly pale, totally insensible, and covered with a cold sweat; the pulse is hardly perceptible, and if relief is not speedily obtained by vomiting or the stomach pump, the patient will die of syncope. Such cases once seen are easily recognised, and their treatment is simple. The stomach-pump should be at once used, and stimulants given—strange as it may seem; the best is ammonia, and there is no better way of giving it than applying it to the nose. After the stomach has been well washed out, a little ether will do good. In some cases death ensues speedily, before relief can be given; in others recovery after treatment is speedy and perfect, though the patient may suffer for a day or two from gastric catarrh.

Chronic poisoning by alcohol is usually associated with want of proper nourishment, the patient having lost appetite and digestive power long before applying for relief, or he may seek relief for these alone. In such cases the patient is restless and nervous, unable to settle to anything, and unable to sleep soundly or even to sleep at all. He is depressed in mind, lives in continual dread of something happening, and complains of giddiness. His hands shake, his tongue is tremulous and coated with fur, his bowels are irregular, his urine scanty and high coloured. Sometimes he complains of sickness, especially in the morning, and there may be vomiting. Such patients may be abnormally stout, or they may be thin and more

or less emaciated; they have little or no bodily vigour, and their skin, especially the face, is sometimes covered by an eruption of unhealthy pimples. The breath is often peculiar—sometimes smelling like butyric acid, at other times having a sweet, mawkish odour. In such patients too we have usually the signs of chronic gastric catarrh, and it may be those of cirrhosis of the liver.

The proper *treatment* in such cases is to open the bowels freely, and in many cases an emetic does good. After this, nutritious, but not rich food must be given in small quantities tolerably frequently, and the patient made to take abundant exercise in the open air. Stimulants are to be discontinued, or only given in small quantity as aids to digestion. No opium or chloral should be given, though a dose of bromide of potassium may be given at night. The patient soon recovers from the alcoholism, though it may be with a permanently weakened digestion, or even more serious lesions.

DELIRIUM TREMENS.

In the third form of alcoholism we are called upon to treat, the symptoms are mainly but not entirely referrible to the nervous system. Great weakness is also characteristic of the condition which is commonly described as *delirium tremens*, *mania a potu*, or delirious alcoholism. Delirium tremens may occur in various ways: it may occur as the result of a prolonged debauch, or it may suddenly develop itself in one who has long been accustomed to "soak," in the way of dram-drinking, or it may appear in one who has habitually drunk to excess without any apparent injury to himself on the occurrence of any slight accident or mental shock. Of these the first, if not superadded to the second, is most manageable; the second is often singularly unfavourable to treatment; the third is in many cases, but not by any means in all, chiefly of importance as complicating the accident.

The malady is ordinarily ushered in by signs of general debility and disordered nerve power. On the least exertion fatigue is complained of, and the body is covered with sweat; there is no appetite, and no digestive power; the breathing is irregular, the pulse small and feeble, the tongue and perhaps the hands tremulous; there is depression of spirits and undue anxiety about business and the like. If the patient sleep at all, he is troubled

with frightful dreams, but most frequently he does not sleep. The hallucinations may continue after waking, always taking the most frightful forms. This speedily ushers in the delirium, which is of a busy kind. In the milder forms the patient only fancies himself actively engaged in his ordinary affairs, or is troubled about domestic matters; often he is annoyed by the voices of people traducing his character, especially if he shuts his eyes; but in the worst form he sees horrible and hideous objects, which torment him at all times, whether his eyes are shut or not. A patient in such a state is a terrible coward, but his cowardice may make him violent in trying to escape from his fancied tormentors, and influenced by such feelings he may become dangerous to himself or others. This does not continue long: if the strength is well kept up and the case at all favourable, the malady exhausts itself, the patient falls into a sound sleep, and wakes convalescent; but in others collapse may suddenly and unexpectedly occur, and the patient sinks. Usually too the appetite has gone or the stomach is unable to retain food; the pulse is quick, feeble, and dicrotous; the respirations become increased in frequency and wavering in motion; the tongue is furred, and the bowels constipated. Restlessness as well as weakness is very characteristic of this malady. The tremulous movements already referred to are most frequently encountered in confirmed dram-drinkers beyond middle life; they are not so marked in young individuals, and may be absent. The malady usually lasts from three to seven days, but may end sooner, especially if fatally.

The diagnosis in delirium tremens is hardly mistakable: its prognosis is decidedly good, the great majority recovering without any treatment at all. The mortality is increased in hot weather, but varies greatly: it is greatest in those attacked between twenty and forty.

Treatment.—Simple as this may appear—for it essentially consists in letting the poison work itself out, while the patient's strength is kept up—occasions do arise which try the judgment severely, and fatal cases will occur in spite of every precaution. Nutritious food is the most important matter, and it should be tasty as well as nutritious. This is of all things the most to be relied upon. Shall we give alcohol in any form? Better not, if it can be avoided, but sometimes it must be given, especially to get the patient to eat. The best plan of

proceeding is to remove the patient to a cool, dark room, where he can neither harm himself nor anybody else; he should be well watched, but never, if possible, left alone or confined mechanically; this we hold to be very important. Keep the room warm (at a temperature of 68°), so that the patient cannot catch cold, and well ventilated. Keep him supplied with good food, and let him move about freely till he falls asleep. The attendants must of course be changed from time to time. Iced drinks should be given, and cold cloths applied to the head. The bowels are to be kept open, but by saline purgatives. In many instances tepid sponging will give great relief, and in others nothing does so much good as the wet sheet packing.

As to drugs, they had better, as far as possible, be avoided. Some have praised chloral in 30-grain doses, but it often aggravates the condition. Some have employed capsicum in very large doses, but it is not necessary. Others have used digitalis in large doses, but this is dangerous, and better avoided. In many cases bromide of potassium seems to suit well. Opium, which used to be considered the sheet anchor, requires always to be handled with caution. If given at all, it should be given hypodermically, and in a dose not exceeding the fifth of a grain at a time. A little atropine may be combined with it. It should not be given if the face is flushed, the eye ferrety, and the pupil contracted. In all cases it must be given with care, for it is to be feared that in many cases the remedy has in times gone by been worse than the disease.

Dipsomania is a condition of alcoholism which commonly occurs in one originally of weak intellect. In it the individual loses all shame in procuring alcohol, though previously a man of honour and probity. It is useless to reason with such: they will say yea to your face and turn to their poison as soon as your back is turned. They will lie, steal, beg, borrow, and be guilty of all kinds of meanness for alcohol. For these there is but one remedy—temporary incapacitation—*i.e.*, locking up.

PLUMBISMUS—LEAD POISONING.

Lead poisoning is intimately associated with mal-nutrition, for not only does it give rise to muscular wasting, but it is commonly caused by particles of lead salts intro-

duced into the system with food. The individuals most subject to lead poisoning are the workers in white or red lead factories, and painters. It was at one time common in France from the custom of sweetening sour wine by putting into it a lump of litharge; and in Devonshire from making cider in vessels more or less composed of lead. From these circumstances the most marked feature of lead poisoning got the name of Colica Pictonum and Devonshire Colic. Nowadays, this form of the malady is commonly called Painters' Colic.

Lead colic begins after the poison has for a time been introduced into the system, and is characterized by griping, twisting pain; there is obstinate constipation, which has generally lasted some time before you see the patient. There is no tenderness, but sometimes relief on pressing the abdomen, and the pulse is calm. Often the bowels seem knotted. If the gums be examined, it is common in most cases to find a blue line in the flesh where it joins the teeth; but this is more frequent in the form of poisoning which comes on after prolonged exposure to the influence of lead.

Treatment.—In dealing with lead colic, the first thing is to move the bowels, and this is best done by repeated doses of Epsom and Glauber's salts, with some sulphuric acid. In some cases electricity has been made use of to get the bowels and abdominal walls to contract, but this is seldom necessary. A hot turpentine stupe may be applied to the abdomen, or the patient placed in a warm bath and directed to use the water as an enema. When the bowels are opened, the road to recovery is easy.

Lead Palsy occurs in those who have been for a longer time exposed to the influence of lead poisoning. It is commonly very insidious. It attacks the extensor muscles of the forearm first of all, so that when the arm is raised the hand hangs down. Hence arises the name commonly given to the malady of *Wrist Drop*. Occasionally all the muscles of the upper extremities are involved, but this is not very common. Under the influence of the lead, the muscles shrink and waste, and cease to respond to the ordinary interrupted galvanic current, but they readily respond to the continuous current when interrupted; which is very important, from a diagnostic point of view. Such patients are usually wan, and look ill nourished; they are prone to gout, and certain forms of rheumatism. Sufferers from lead palsy have commonly also suffered from lead colic.

The *treatment* of lead palsy is simple. The bowels are to be kept open by saline purgatives. Iodide of potassium in some bitter infusion is to be given in doses of 5—10 grains three or four times daily; the muscles of the paralysed part are to be exercised daily by Faradisation; though at first they refuse to respond to it, by-and-by they will do so. Sulphur baths have been recommended. Exercise in the open air, and good food materially promote recovery. Cleanliness is the great prophylactic. The lead in the system passes off by the urine, and may there be detected.

GOITRE, OR BRONCHOCELE.

The malady known as Goître in Switzerland and Derbyshire Neck in this country, and which is also known as Bronchocele, is undoubtedly associated with imperfect nutrition, though its exact causation is not known. Where it prevails it is usual to attribute it to the quality of the drinking water; and though this is by no means proved, yet in most districts where it prevails the water springs from, and contains in solution, magnesian limestone. Snow water was supposed at one time to give rise to it. In some parts of Switzerland goître is associated with an idiotic or semi-imbecile condition, constituting what is known as cretinism.

Goître consists essentially of a swelling of some portion of the thyroid gland, sometimes of its whole substance. The right lobe is more frequently enlarged than the left. The tumour is painless, but unsightly. At first the mass is soft, and contains cysts filled with a thick viscid fluid, but by-and-by it hardens and may be converted into a calcified capsule with contents of a more or less viscid character. Occasionally these tumours put on what seems to be a cancerous-looking character. The mass of the tumour may prove troublesome by pressing on the trachea and œsophagus, and so interfering with breathing and swallowing. Goître is by far more common in women (12 to 1) than in men, and in them the size of the tumour may be increased at the catamenial periods.

Treatment.—The first thing to be done is to remove the patient from the district where the goîtrous swelling was produced, or if that be not possible, to procure the improvement of the water-supply, if necessary by the collection of rain-water. The great remedy for goître is iodine, and this is

usually administered as iodide of potassium internally, and as an ointment or paint externally. A good plan for giving iodine is to dissolve iodine in water by help of iodide of potassium (Liquor Iodi), or the iodine may be prescribed as iodide of iron. In these cases iodide of potassium had better be given at first in small doses, not exceeding five grains; and cod-liver oil is an exceedingly useful adjunct. Externally the iodine ointment may be used, or one composed of the scarlet iodide of mercury, or the iodide of lead. This plan has been used with great success in India, the patient rubbing the ointment well into the tumour. The officinal ointments of these salts may be tried in this country. When these remedies fail, or should the goître undergo any change towards what appears malignancy, a surgical operation for the removal of the mass may be justifiable, but not otherwise, except the pressure symptoms become very urgent. The introduction of setons into the mass has sometimes succeeded in causing its removal. Ordinarily iodine suffices.

EXOPHTHALMIC GOITRE.

This malady, also known as Graves' Disease and Basedow's Disease, has nothing in common with goître, save the swelling in the neck. This swelling in the neck seems mainly due to enlargement of the vessels of the thyroid gland, so that it commonly pulsates, but in part is also owing to increase of gland tissue, or even to cystic formation. The eyes protrude to a greater or less degree from their sockets, owing to swelling and œdema of the intra-orbital fatty tissue, so that in some instances the eyelids can no longer cover the eyeballs. The eyes may be destroyed, as the result of exposure and irritation; but except in this way, vision is not affected. The patient, as a rule, is painfully nervous. The heart palpitates violently, and beats 120 or 140 times per minute. A loud systolic bruit, most frequently purely functional, and such as is heard in anæmia, is heard over the base of the heart. The triple signs of the disease, therefore, are:—projection of the eyeball—*i.e.*, *proptosis*; enlarged and pulsating thyroid; and palpitation of the heart, with abnormal, probably anæmic bruits. The vessels of the neck, too, are seen even at a distance to pulsate violently, and a bruit may be heard in them. The slightest excitement sends up the pulse, which is already high. The nutrition is always impaired—sometimes markedly so, and the patient's temper is bad,

usually irritable. The patients are almost always youngish females (male patients are older), and they are worse at the catamenial periods, the thyroid then enlarging, and the eyes protruding more than usual. The patient is often so nervous as to be unable to use her hands at any kind of occupation.

The origin of the disease is often connected with some powerful mental emotion; its essential characteristic almost certainly is a sub-paralytic condition of the vaso-motor system of nerves. Usually the malady tends to improve, though slowly, and seldom ends in death; if so, it is from the impaired action of the heart.

Treatment.—The chief phenomena of this disease are essentially nervous. Iodine is worse than useless—it does mischief. There are no remedies like digitalis and iron. These remedies, together or separately, though the digitalis is indispensable, will usually effect a cure, though the enlarged thyroid may persist for a time. The practitioner is not to be hindered from giving digitalis by signs of weakness: these may be remedied after the palpitations are quieted, but not before. In such cases it is often better to give no iron, but rather a stimulant like ammonia or ether, and to wait till iron can be given. A residence in the country in some healthy part should be sought as soon as possible. The food should be plain and nourishing. Everything should be done to strengthen the general health, and to quiet the nervous system. Electrization of the sympathetic has been proposed on purely theoretical grounds.

ANÆMIA.

Besides the conditions of mal-nutrition induced by want of food, or improper food, and bad water, there are others where all of these may be supplied in due quantity, and yet mal-nutrition may exist. Often under such circumstances the wanting requisites are light and air; as a rule, however, the want of these is coupled with the former. Again, if the balance be on the side of expenditure, as in wasting diseases, excessive drainage of the system by exhausting discharges, or yet again when a due supply of red corpuscles is not provided by the spleen, whether from retention or imperfect formation, the same end may be brought about. In such cases there is more or less pallor, and the condition is characterized as *anæmia*.

There is not a due proportion of coloured corpuscles in the blood, which is more watery than usual; hence the term *spanæmia* (poorness of blood) is sometimes made use of.

In such patients the tint is pale or waxy. The lips, tongue, and gums are paler than usual, the conjunctivæ are unnaturally clear and pearly; the pulse is easily excited on exertion; there is almost constant headache and aching at the top of the head; the mind is depressed, dull and feeble, and the bowels are constipated; there is loss of appetite and a tendency to acidity and flatulence; the urine is abundant, limpid, and deficient in salts. The patient is easily fatigued: though work be undertaken with spirit, it is soon laid aside, probably with breathlessness (for want of the oxygen-carriers, the red corpuscles) and palpitation, in imperfect endeavour to make up for deficiency by rapidity. The vessels pulsate inordinately, insomuch that the beating of the aorta just behind the epigastrium may be taken for an aneurism. The surface of the body is cold, again for want of oxygen-carrying substance, and the hands perspire freely. The mind is easily excited, and the temper altered. In females the catamenia are irregular, sometimes suppressed, and leucorrhœa is common. The ankles often swell towards evening, or after exertion, and the degree of swelling varies from time to time. There may even be very slight general dropsy from sheer hydræmia. In such patients it is usual to hear a loud systolic bruit over the pulmonary artery, and the bruit may ordinarily be increased by causing the patient (especially if young) to expire deeply, and pressing on the costal cartilage. Bruits may elsewhere be induced by pressing on the arteries, especially on the subclavian and aorta. In the larger veins a continuous hum (*bruit du diable*) is sometimes heard.

Treatment.—The basis of this is iron, which has directly or indirectly a most important influence on the generation of red blood corpuscles. If there has been very great loss of blood, as after childbirth with placenta prævia, or from any such cause, it may be necessary, before giving iron, to give stimulants, good food, and careful nursing; but in idiopathic anæmia this is seldom or never the case. The best form of iron for restoring the blood to a healthy redness is the reduced iron, which is best given with food. Two or three grains may be given. Next in order comes the carbonate, which re-

quires sugar to keep it. Perhaps the best form of prescribing the carbonate is as the old-fashioned Griffith's mixture—mistura ferri co., in half-ounce or ounce doses. The citrate of iron, especially if combined with quinine, is good, and some speak highly of the phosphate. The astringent preparations of iron are not such good blood-formers as these milder compounds.

With all of these, however, it is necessary to give opening medicine, and a very good plan is to give the two together, say two or three grains of the granulated sulphate of iron, a scruple of Glauber's salts, and ten drops of dilute sulphuric acid, in a couple of ounces of water two or three times daily. Another favourite combination in these cases is the compound decoction of aloes and mistura ferri co.—half an ounce of each.

For the nervous symptoms strychnine, either in the form of liquor strychniæ (ɱx) or the extract of nux vomica (gr. ½) should be given. This may readily be given in combination with iron. A great thing is to get the patient to eat, and to that end wine and fresh meat should be given; but some fragrant light wine, which will act as an appetizer, not a wine strong in spirit, should be given. Change of air, especially to the seaside, or to an iron spring, and cold sponging or sea-bathing are powerful adjuncts.

CHLOROSIS.

Chlorosis, or the *green sickness*, so called from the greenish-yellow hue of the patient, is merely a form of anæmia which attacks young women, about puberty or shortly after, especially if the menses appear unusually early. In these there is often depraved appetite, constipated bowels, abundant pale urine, puffy or relaxed integuments, but fairly abundant subcutaneous fat. The tongue is furred and indented by the teeth, and the mucous membranes pale. The menstrual discharge is absent, or scanty and irregular: there is frequently also leucorrhœa, and it may be dysmenorrhœa. There is a strong tendency to neuralgia and to hysteria: though no regular attack of the latter may be ever developed, it enters into most ailments and complaints on the part of the patient. In most other respects the symptoms are those of anæmia. Between the two this distinction is sometimes drawn—that in chlorosis the red corpuscles of the blood

are deficient, whereas in anæmia the plasma is also altered in quality. In chlorosis too, the subcutaneous fat is abundant, whereas in many forms of anæmia it is entirely absent. Hydræmia tends to dropsy, simple chlorosis does not.

The *treatment* of chlorosis is, like that of anæmia, mainly chalybeate. That preparation of iron suits best which can be taken longest without upsetting the patient. Abroad, a preparation known as Blaud's pills has a great reputation. They consist of ferri sulphatis, potassæ carbonatis et tartaris, āā ʒss, tragacanth q. s. Divide into 96 pills, three for a dose three times a day, the quantity to be gradually increased.

SCROFULA.

The term *scrofula* is applied to a condition which may be and for the most part is hereditary, especially in children born of parents weakly, from whatever cause, and which manifests itself chiefly in a tendency to swelling of the lymphatic glands, and to certain low forms of inflammatory mischief of the mucous membranes, bones, joints, and to a less extent the skin, and such tissues as the corneæ. Moreover, an individual who from his appearance may be prejudged as prone to such mischief, is spoken of as scrofulous or strumous. There is nothing specially characteristic in scrofulous inflammations except that they are easily excited and slow in progress, whilst their products specially tend to a cheesy metamorphosis rather than to reabsorption. Glandular enlargements are frequent and persistent, but ulcers and abscesses of a strumous kind may also appear. Acquired scrofula generally arises from a combination of causes; chief among these is a want of nutritive food, especially of fat meat. The diet may be plentiful, but containing little nutriment. Infants fed on corn flour and such like farinaceous diet are prone to the evil; so too are agricultural labourers, whose diet is plentiful but poor. Next in order comes want of fresh air, but fresh air will not counterbalance the want of proper food; hence in many parts of the country the strumous condition is more common than in town, but poor diet and a close, confined atmosphere are together the most powerful means of inducing scrofula.

The chief noticeable change in scrofula is an enlarge-

ment of the glands, especially of the neck. This may be inflammatory or non-inflammatory, and the glands are often enlarged in groups. The enlarged glands may become inflamed, the skin adherent to them, and abscesses may form, bursting by an irregular orifice, or the pus may dry up, and the hard body left may act as an irritant and again set up inflammation. The bronchial and mesenteric glands are equally liable, with those of the neck, to such enlargements and their consequences, probably from catarrh of the adjacent mucous membranes. The same constitutional condition which induces these glandular enlargements may exhibit itself in ulcers and abscesses in any part of the body, especially the skin, eyelids, and joints. As a rule the patients recover from these, though sometimes they end fatally; but a great number of strumous subjects die of intercurrent maladies of an acute kind. The scrofulous habit of body has undoubtedly two totally different sets of appearances. In one there is a dark complexion, a thick, rough skin, coarse features, enlarged abdomen, flabby muscles, and swollen glands. In the other there is a fine, delicate, transparent skin, light hair and eyes, and marked prominence of veins. The muscles are small and soft, and the structure generally slight. Scrofula is essentially a disease of youth. It does not manifest itself till some time after birth, and after puberty generally disappears; but any exposure to untoward circumstances, may relight it at this time, even after it has for a time lain dormant.

Treatment.—Each special manifestation of scrofula must be treated on its own merits, but the general condition must be dealt with if possible before these arise. As already pointed out, the malady is mainly congenital, and hence improper marriages, especially of near relations, should be avoided as far as possible, and the dictates of common sense will prescribe. When a weakly child is born it is often exposed to the evils not only of inherited disease, but also to that of insufficient nourishment, for very frequently in such cases the mother's milk, especially if the weakness is mainly on her side, is insufficient in quantity and quality for the child's nourishment. Under such circumstances a wet nurse is imperative, for trying to bring up the child by artificial food is worse than exposing it to the evils of imperfect nourishment from its mother. As soon as possible the child should have plenty of free open air. To this end the nursery should be well venti-

lated and at the same time well heated. Exercise should be enjoined in moderation, and the diet carefully selected. It is essential that this should be plain and nourishing and given in due quantity at regular intervals. When the patient shows a tendency to emaciation, cod-liver oil is the chief remedy. It should be given in small quantity, and is always best taken just after food. A teaspoonful is enough to begin upon. No form of catarrh should be allowed to go unattended to. In other forms of scrofula, when there is no emaciation, but apparently a sluggish state of those essential vital changes which should go on actively, cod-liver oil is useless. Sea-bathing and abundance of fresh air is best for such patients. When these are not attainable, bathing in fresh water or in brine should be enjoined. In many of these cases what is called hydropathic treatment does good. Quinine and iron are also valuable remedies, as are the whole, classed under the heading tonics.

TUBERCULOSIS, AND THE TUBERCULAR CONSTITUTION.

By tuberculosis we understand the tendency to the more or less general growth of the anatomical structure we call tubercle. This tendency is most frequently hereditary or dependent on various hygienic conditions. It is closely allied to or identical with the scrofulous constitution already spoken of.

Tubercle is nowadays commonly esteemed to be a growth more or less allied to lymphatic gland structure, though many authorities dissent from this view. At all events, it consists of a reticular structure supporting cell-like bodies, in appearance closely allied to colourless blood corpuscles—*i.e.*, leucocytes, however originating; some also speak of a giant cell-growth, and an epithelial growth in the earlier history of the tubercle. In the earlier days, when tubercle was first spoken of, it was described as a small cheesy mass (*yellow tubercle*), but as it was found that other substances besides tubercle tended to become cheesy, the *grey granulation* was accepted as the type of tubercular growths. By the time a tubercle has become yellow, its structure has essentially altered, and it is not easy to say what has been the origin of its component cells. Neither is it easy to say what share inflammation has had in producing the constituents of the new growth.

Tubercle may be developed in various situations, but

most frequently in the intestines, peritoneum, lungs, and meninges, there giving rise to specific and tolerably well-marked diseases. In the infant the head is often affected, and a tubercular meningitis is found; in later life the lungs and air-passages are most frequently the sites of the tubercular growth, giving rise to the malady called phthisis. For this reason, although we are bound to recognise the morbid state or tendency, it is usually more convenient to discuss tubercular maladies according to their site.

Tubercle may be produced by inoculating cheesy or similar matters underneath the skin of rabbits and guinea-pigs. As a result of such inoculation a general dissemination is produced, though there is a greater tendency to form tubercles in some situations than others. The theory of a self-inoculation of tubercle from old-standing cheesy deposits in any part of the body has been partially founded on such experiments, but is not accepted by all.

Tuberculosis is most common in the children of weakly parents, especially if they themselves are tubercular. But it may also be developed, and the chief causes of its development are bad and insufficient food, impure air, and damp and cold. All these causes operating together, as they frequently do, very easily induce tubercle.

In individuals of a tubercular tendency there is usually a weak digestion, with acid eructations, a dislike of fat, irregular bowels, and a capricious appetite. The circulation is easily excited, and the face easily flushed, the muscles are soft and flabby, and the bodily power small, though mental power may be considerable, and the emotional characteristics are generally marked. There are considerable variations in the bodily temperature. In what is called *acute tuberculosis*, *i.e.*, the general formation of tubercles throughout the body—an acute disease process, in many of its symptoms resembling enteric fever—this is always high—102°-103° F., or more, though there may be remissions.

The tubercular tendency, like most others, is best avoided, and to this end sensible marriages should be insisted on. Men and women have no right to bring a race of miserable beings into the world. Of course such considerations are usually overlooked, and we can only do our best to mend the matter. To this end the mother, during pregnancy, must take every precaution to maintain her own health, and to invigorate her offspring. After birth the child should be carefully looked after as

regards food, clothing, and air. As the child grows up these precautions must never be relaxed, and equal, or even more care must be taken with the physical than the mental education of the child. The body should be carefully trained so as to equally develop all parts of it. The skin should always be kept open, and flannels are indispensable. The bedroom should be large and well ventilated, the bed should be a good hard mattress. The food should be well cooked, and selected so that there is a due admixture of animal and vegetable matters in the dietary. As long as there is no actual disease medicines are better avoided. The bowels should be kept open by regulating the diet, especially by modifying its bulk. Milk should always form an essential ingredient in the diet. Stimulants should be avoided as far as possible, especially in children, but a glass of good beer or of light wine will often foster appetite and digestion. Cod-liver oil is not a medicine, but a food, and so is best given along with other food or just after a meal. At all times digestion must be carefully attended to. (See also Phthisis and Tubercular Meningitis).

GOUT.

Gout, though notably a hereditary malady, may be generated by errors in diet and regimen, especially by the consumption of large quantities of nitrogenous food, and the use of certain beverages tending to prevent bodily waste, and inactive habits. Gout is either acute or chronic. When acute it commonly attacks the ball of the great toe, or some other small joint, giving rise to pain, swelling, tenderness, and redness of the affected part, but this never goes on to suppuration of the joint. In the chronic form it gives rise to more or less important changes in the joints.

Gout is much more frequent in men than women, and if it does occur in the latter is usually hereditary. The disease first shows itself, as a rule, in patients over thirty, and more frequently over forty. If it appears before thirty, it is commonly due to inherited taint. The inducing causes of gout are chiefly a sedentary mode of life, rich food, and the use of such liquors as port wine, sherry, and Madeira. But it also occurs in individuals in a lower grade of life, and then it may commonly be traced to the use of such drinks as old ale, Burton ale, or stout. Spirits rarely induce gout. Lead poisoning is a frequent predisposing cause of the gouty habit, and so are certain forms of

indigestion. This habit of body may manifest itself from time to time in acute outbursts of the malady, the individual being tolerably well in the interval. The immediate causes of these outbursts are such as errors of diet, anxiety, fatigue, or other depressing influences. But in the true gouty habit, there are other marks of the condition, such as permanent indigestion, especially from certain articles of food, constipation, or irregularity of the bowels, palpitation, general weakness, with indisposition to exertion, irritability of temper, headache, and flushing of the face. The urine is scanty and high-coloured, and tends to deposit urates. There is great susceptibility to damp and cold, and the patient is prone to neuralgic attacks in various parts of the body. There are also deposits of urate of soda, in the form of a chalk-like material, called *tophi*, in the joints, especially of the fingers and toes, and in the ears, which are quite characteristic. This general condition may be varied from time to time by attacks, more or less acute and regular, of the malady.

An acute attack of gout generally comes on suddenly, though there may be, especially in those subject to its inroads, warnings of its onset. The subject goes to bed quite well, and is awoke in the morning about three or four o'clock with intense pain in the ball of the great toe. This, on examination, is found to be red, not swollen, but particularly tender. The veins are distended, redness and swelling may extend some distance across the foot and up the instep, and the legs are cramped. The patient is restless, the tongue furred, the bowels constipated, the urine scanty and high coloured, with or without deposit of a brickdust sediment of urates. In many cases the urine requires to be passed at frequent intervals, and gives rise to some scalding. The pain and tenderness, marked from the first, may increase for a day or two, being better in the morning, worse at night, but soon begin to wear off; the swelling diminishes, the joints still pitting on pressure, a slight shedding of the cuticle follows, and the patient gets well in from four or five days to a fortnight, after which he feels better than for long before the attack. Other parts are rarely affected, though both great toes may be so, in a first attack. With due care the attack may not return for many years, but usually the proper rules for living—and such people must always live by rule—are neglected, and the attack is renewed, especially if the disease is hereditary. Generally the attacks become more and more

frequent, and more and more of the body is affected, with advancing age, until the patient is hardly ever free from pain: every joint in his limbs may be affected, and the patient becomes the subject of chronic gout, which may finally wear him out, or he may perish of some intercurrent malady. There is commonly great distortion in chronic gout from deposits in the joints and tissues around, insomuch that the fingers, from deposits of the chalky material (urate of soda) and anchylosis of their joints, become quite useless, and hang from the palm like a bunch of carrots. Similar deposits occur in the ears. The chalky deposits often tend to set up irritation, and to cause suppuration, and give rise to intractable ulcers, whence issues the chalky matter already deposited. In those who have fairly become the subjects of gout, *irregular* attacks may occur, or the malady may disappear from the joints and attack some internal organ. This last is called *retrocedent* gout, and the parts mostly affected are the stomach and heart. Such attacks are especially liable to be brought on by exposing the affected limb to cold. or by applying cold applications to the affected joints. We also find gouty affections of the lungs, especially bronchitis, and skin eruptions, eczema and psoriasis of a very troublesome kind. Some nervous affections may also be traced to gout.

The diagnosis of gout is usually easy. The history gives the necessary clue in irregular attacks, and in a first attack the symptoms are unmistakable. The only thing liable to be confounded with it is rheumatism, but that rarely affects one joint, and that joint is still more rarely the ball of the great toe. As already pointed out, where gout prevails the social position of the patient is no criterion, for there is a poor man's as well as a rich man's gout. The existence of chalky deposits in the joints or ears is an almost infallible sign.

Gout is nowadays commonly supposed to be due to the presence of uric acid in the blood. Certain it is that in gouty subjects we find deposits of urates, but the true cause probably lies in imperfect changes in certain articles of food, resulting in compounds intermediate between albumen and urea, one of which is uric acid. In and around the joints are deposits of urate of soda; the ligaments become rigid and the cartilages destroyed. The kidneys too suffer, apparently from the irritation of abnormal urine; and they are commonly smaller than

natural, their cortices wasted and shrivelled, and their capsules adherent. Sometimes infarcts of urates or uric acid are formed in them. The lungs too, with the heart, stomach, and great vessels, suffer, but the kind of change in them beyond a certain degree of fibroid or granular change is less known. Piles are a common and troublesome complication in gouty subjects.

Treatment.—The treatment of gout resolves itself into three parts;—the treatment of an acute attack, the prevention of a second, and the treatment of the chronic stage of the malady.

In acute gout there is much pain: this must be relieved. There is constipation: that must be removed. To relieve the pain it is best to deal directly with the part affected. To that end warm fomentations of acetate of lead and acetate of morphia or opium (liq. plumb. subacetatis ℥vj, morphiæ hydrochloratis grs. ij, solv. in acido acetico dil. et misce) should be applied to the joint, and covered with oiled silk and a third layer of cotton wool. In less acute attacks a hot and strong alkaline lotion will often do great good if applied in the same way. Internally, if the bowels have been moved colchicum may be given, as vin. colchici min. xx every four or six hours, but not for more than a day. If the bowels have not been opened, a pill containing colchicum, aloes, and calomel (colchici ext. acet. gr. ½, ext. aloes socotrinæ gr. ½, calomel grs. ij), may be given and repeated at intervals. In those who have become markedly gouty, colchicum, though tempting, is better avoided. For them an alkaline purgative is best, say sulphate of soda (℥ij) with bicarbonate of potash and citric acid, given effervescing; the citrate of potash (grs. xx—xxx) to be substituted for the sulphate of soda when the bowels have been well moved. In this way a diuretic is substituted for a purgative effect—an important change. Later still, iodide of potassium in small doses (gr. 5) together with potassæ bicarbonas gr. 10—20, may be substituted. The diet should be light, and mostly farinaceous. Stimulants should be avoided as far as possible. If there is sickness, which is not uncommon, ice and exceedingly dry champagne in small quantities may be given.

To prevent the return of gout, a sedentary life should be exchanged, as far as possible, for one in the open air. Exercise should be taken freely, the hours should be early, the diet plain and *liberal*. Preserved meats of every kind should be avoided; all sweet wines, and all kinds of beer

should be avoided. Claret, Hock, Chablis, or weak whisky-and-water are admissible. The bowels must be kept open—best by some mineral water like Püllna or Friedrichshall; if these are not convenient, then by such a saline as we have already indicated. What are called diluents should be used freely: a tumbler or two of hot water, or of pure spring water containing no salts, every morning and evening is best. A change to a watering-place is of great service; abroad the best waters are Vichy, Homburg, and Carlsbad. If the limbs remain stiff, the baths of Wildbad, Wiesbaden, and Teplitz are useful.

In chronic gout, the same rules, as far as they are applicable, must be carried out. Air and exercise are of the greatest importance, though from debility and pain often not easily procurable; still, they must be aimed at. The grand rules are to keep the skin and bowels open, and the urine free. The diet too must be strictly limited; as little exercise can be taken, the less food is necessary. Meat (especially in the form of highly seasoned dishes) must be avoided or limited. Lithia is sometimes strongly commended; the salts of potash, especially the bicarbonate and citrate, are about as good. A light bitter should be given along with them. The alkaline lotion already alluded to will often do great good when there are chalky deposits to be removed.

RHEUMATISM.

The disease called rheumatism, which consists in a peculiar painful swelling of one or more joints, especially the larger ones, or affections of fibrous structures, often accompanied by a high temperature, and usually also profuse acid perspiration, is essentially a constitutional one. The tendency to rheumatism may be inherited, and it is more likely to break out in a young subject than gout. It is most frequent between puberty and the age of forty. The immediate cause of rheumatism seems to be in most cases exposure to cold and damp, especially when combined; and the more the individual is predisposed to it, or the weaker he is, the less will be the cause necessary to set up the malady. We commonly see rheumatism in two forms—that called acute rheumatism or rheumatic fever, and the subacute variety. Other varieties are muscular rheumatism, such as certain forms of lumbago and stiff

neck. Gonorrheal rheumatism and the malady called rheumatic gout or rheumatoid arthritis are quite distinct affections.

ACUTE RHEUMATISM.

This form of the disease comes on with shivering followed by feverishness, and within eight-and-forty hours pain and stiffness in some of the joints. These become rapidly aggravated, and joint after joint becomes involved, until the patient is perfectly helpless, and dreads the very idea of movement. The joints, when examined, are found to be swollen from œdematous infiltration of the tissues around them rather than effusion into the joint, and are tender, often red, and extremely painful. The larger joints are most frequently affected, and the lower extremities more than the upper ones. One joint after another may be affected, the malady disappearing in one set as it begins in the others. The surface is hot, and bathed in profuse sour-smelling sweat. The pulse is rapid and the temperature high, from 100° to 104° Fahr., and this too before the joints are much affected. The tongue is covered with a white fur, there is much thirst, the appetite gone, the bowels confined, the urine scanty and high coloured, with a tendency to deposit urates; the general symptoms are in direct ratio to the violence of the local attacks. The condition of the patient is peculiarly helpless, being afraid to move from dread of pain. After a time sudamina form on the skin from the perspiration. The exact duration of the disease is very uncertain, lasting from a few days to months, and not unfrequently there are relapses. The pain in the joints is worse by night than by day. As the malady abates the patient sleeps and eats better, but is exceedingly feeble and markedly anæmic, but from these he soon recovers with due care in an uncomplicated case. One attack undoubtedly predisposes to another, and the disease is perhaps more frequent proportionally among women than men, bearing in mind the occupations of the two sexes.

In acute rheumatism there is a great tendency to certain complicating affections—these are pericarditis, and endocarditis on the left side of the heart. The onset of either or both of these may be very insidious, and may be only recognisable by auscultation. Hence it is commonly the practice to examine the region of the heart carefully

and regularly in order to detect any mischief. The part where pericarditis is most easily detected is over the base, but the endocardial mischief may affect either the aortic or mitral valves, and so be best heard either at the base or apex, as the case may be.

Pericarditis is indicated by a friction sound, endocarditis by a murmur, though the distinction is not always easy. Most frequently the cardiac affection begins early in the disease, and in cases where due care is taken of the patient, after the onset is fairly past there is much less risk of complication, save a fresh attack of the disease supervene after a partial convalescence, as is not unfrequently the case. Other complications may arise, as pleurisy, meningitis or pneumonia. Whilst in some cases, for unexplained reasons, an outbreak of chorea is closely connected with the disorder. More recently the condition called *Hyperpyrexia* has been studied as it arises in rheumatism. In the acute form of the malady the temperature is always high, it may rise to 104° Fahr., or even 105° Fahr., still this, though indicating a severe attack, does not portend any danger from the excess of bodily heat. It is only when the temperature begins to exceed 106° Fahr., and is rising steadily, that danger from this source is to be apprehended. Then it may rise to 109° Fahr., or even higher; but if so, the fever commonly proves fatal, and inevitably so if the heat is not reduced artificially. Hyperpyrexia is ushered in by arrest of the cutaneous perspiration, the skin becomes dry and very hot, and the patient becomes restless and more or less insensible. Except the temperature be reduced, this ends in coma and death. Hyperpyrexia may occur in other maladies, as typhoid fever, but is most common in rheumatic fever. In fatal cases of acute rheumatism, which are rare, the cause of death is usually inflammation of the heart or hyperpyrexia; but it must be remembered that though not the direct cause of death, rheumatism, in many is so indirectly by laying the foundation of permanent heart disease, especially valvular incompetency.

After death there is often little to be seen in the affected joints—some slight swelling with effusion around the joint, hyperæmia of the synovial membrane, and slight turbidity of the synovia are all. Even these may not exist, and on the other hand, marks of a high degree of inflammation are occasionally found. It has been a favourite theory with many that acute rheumatism is due to the presence of lactic acid in the blood; but of this there is not the

slightest proof. What are commonly called proofs are in reality nothing of the kind.

Treatment.—Many plans of treatment have been proposed and adopted in rheumatic fever; but certain investigations made by physicians of eminence would tend to show that with due care as to diet and protection the patients may recover in an equally short time without any medicine at all. This, however, is not the general opinion, which is distinctly in favour of medication. Under any circumstances the patient should always be put in blankets. The treatment resolves itself into two parts. One for the relief of pain, the other for the removal of the constitutional condition on which the malady seems to depend.

To relieve local pain and tenderness the plan of wrapping the joints up in cotton-wool is that most frequently adopted, but undoubted the plan of blistering the immediate neighbourhood of the joints is that which gives most relief. The blister should be kept on for a short period only, and should be followed by large linseed meal poultices. Another plan more applicable to the subacute form is to apply hot opiate or alkaline lotions to the parts affected. The use of opium internally has been forbidden by some; why it is hard to say—at all events, chloral may be made use of to procure sleep. Belladonna too may be given. There is no reason why morphia should not be given hypodermically. The acid theory of rheumatism gave rise to the treatment by alkalies; and whatever may be said of the theory the practice is good. To this end the bicarbonate of potash is given, best in effervescing draughts in doses of gr. xxx or more every four hours. This may be continued until the pains abate. Another remedy is chlorate of potash, and the best plan of giving it is to allow the patient to drink of its solution as much as he pleases. As much as one or two ounces of the salt may be given this way in the twenty-four hours. Lemon juice has been recommended, but it is not much employed. Other remedies have been employed, especially veratria, which seems to act on the general circulation, and quinine in full doses, which undoubtedly sometimes has the power of diminishing temperature.

Of the complications already spoken of, those of the heart and hyperpyrexia are the most important. If there is a threatening of heart mischief, it is a common and good practice to withdraw blood locally either by leeches

or by cupping—not much blood need be removed; but this little distinctly relieves any tightness of the chest which may have been before experienced. More common still is the practice of applying blisters over the heart. These are best followed by soothing poultices. In such cases too it was formerly the practice to give calomel and opium: nowadays this is seldom done. When the heart begins to recover it may still be tumultuous in its beating, and a thick belladonna plaster should be applied, care being taken not to allow absorption if the skin has been removed after the blister.

When the temperature rises above 106° Fahr., steps must be taken to reduce it. To this end the patient must be placed in a cold bath, and kept there until the bodily heat has been abstracted to a considerable extent. Sometimes ice-cold water is used, but constantly renewed water of ordinary temperature commonly suffices. This procedure must be had recourse to again and again if necessary. A good plan, if the temperature is not very high, is to place the patient in a bath at 80° Fahr. and allow it to cool down gradually. As the patient begins to improve it is well to give alkalies and quinine alternately, or together, suspended in mucilage; and when the pains have fairly gone, to give a weak salt of iron like the ammonio-citrate. Some give the liq. ferri perchloridi, but general experience is against its use in the majority of cases.

During the attack the diet must be rigidly regulated, not unfrequently relapses are seen from neglect of this precaution. Milk should be the basis of the food, and beef tea or mutton broth superadded. If stimulants become necessary, brandy is better than wine. When convalescence begins light puddings and fish may be added to the diet, but beef and mutton are not to be given without caution. If the malady threatens to become chronic, cod-liver oil should be added to the diet, a teaspoonful after each meal. During convalescence a change of air to a dry, warm climate is highly desirable.

SUBACUTE RHEUMATISM.

Not unfrequently the malady instead of appearing in the well marked form described above, comes on less decidedly. The temperature is tolerably high, always over

100° Fahr., sometimes 102° or 103° Fahr.; but the joints, though painful, do not swell markedly, and after a few days' rest in bed with due warmth and proper nourishment, with or without medicine, the malady begins to subside. There is, however, considerable risk of relapse, and not unfrequently the heart becomes affected in this equally with the more marked form of the disease. There is often a great tendency to develop this form of the malady after a former attack of acute rheumatism. In yet another set of cases the joints may escape altogether, and the muscles or the sheaths covering them may then become affected. Three forms of this *muscular rheumatism*, as it is called, occur most frequently. These are a kind of lumbar pain called *lumbago*, which may be very severe, sufficient to prevent motion on the part of the patient; *intercostal rheumatism*, sometimes called pleurodynia, which may give rise to such acute pain on motion as to interfere with costal respiration; and *stiff neck*, a kind of torticollis, where the patient is obliged to hold his head in one position to avoid pain. Other groups of muscles may be affected, especially those of the shoulders and hips, but each form may be simulated by neuralgia. The malady seldom lasts long, but may be very painful while it lasts. It is best got rid of by a good sweat. To this end the patient may take ten grains of Dover's powder with some hot drink, and get into bed between the blankets. In the morning a saline purgative or a black draught should follow. A still simpler plan is to take a Turkish bath where procurable, or to step from a warm bath directly into bed without drying the skin.

Local applications may be required, the best are hot fomentations, with opium or belladonna. Where the pain is deeply seated turpentine liniment, and morphia hypodermically, or even iodine, may be required.

If the disease threaten to become chronic, iodide of potassium in five-grain doses may be given with advantage. Tonics must also be prescribed, especially iron and quinine, and hot sulphur baths are of the greatest service.

CHRONIC RHEUMATISM.

This term is frequently applied very loosely. Strictly we encounter two forms of chronic rheumatism: first in those who have been frequently the subjects of acute attacks, and who finally become more or less constantly

affected with rheumatic pains, liable to be aggravated by the slightest vicissitudes of climate. The second and other form is that seen in old people who have led a life of exposure, and who in old age become almost crippled by rheumatic pains and stiffness.

The former variety of rheumatism is best treated by change of climate if possible—a dry, equable one being best. Certain mineral waters, too, do much good. Chief among these are Harrogate and Aix-la-Chapelle. In other forms Vichy and Carlsbad are best, especially if there is also a tendency to gout. For any passing attack the best remedy is the hot-air bath, commonly called the Turkish bath; but a vapour bath obtainable at home may be substituted, though not with advantage. In these forms cod-liver oil is very useful.

In the rheumatism of old people stimulant remedies seem to do most good. Guaiacum, though useless in other forms, does good here, as it does in some forms of chronic gout. A combination of it with cream of tartar, sulphur, and rhubarb, commonly called "Chelsea Pensioner," is especially useful. (℞ Pulv. guaiaci ʒj, pulv. rhei ʒij, potass. acid. tart. et sulphur. sublimati, āā ʒj, pulv. zingiber. ʒij, mel lb. j—dose, 2 large spoonfuls night and morning). Stimulant liniments to the parts and warmth are also of great service, and painting with iodine or the use of iodine ointment frequently gives much relief. Rubbing in any kind of greasy liniment before a hot fire will generally be found of service. Douches of hot water, such as are attainable at some mineral or hot springs, are also valuable as a means of cure, whilst the constant current of electricity is also highly spoken of.

CHRONIC RHEUMATIC ARTHRITIS.

This malady, commonly known as rheumatic gout and rheumatic arthritis, differs in several essential respects from both gout and rheumatism. The disease is almost invariably chronic, and may end in entirely crippling the patient. It may occur at any age, but is most frequent about middle life. It commonly commences in individuals, out of health, who have been exposed to cold, and though the first attack may subside, a second commonly follows, and from this time does not depart, but gradually spreads from joint to joint. The hands are usually attacked at

an earlier date than the feet. The joints in the early stage are swollen, and the quantity of synovia is increased. Later, this is absorbed, and the cartilages of the joints are gradually destroyed, and their capsules thickened. The surfaces of the bones where they come in contact become polished and ivory-like, and the ends of the bones may be misshapen and enlarged by bony deposits. The final result is almost perfect rigidity of the limb or part of it affected. The mischief is often remarkably symmetrical, and the bones tend to become displaced in its progress.

The *treatment* is very unsatisfactory. The diet should be good, but not too rich. Natural wines may be taken. Warmth is important, so is exercise in the open air if it can be taken; hence change of climate is commonly desirable. Thermal waters, as a rule, do good. In their absence hot alkaline lotions should be employed, to be followed by friction with some slightly stimulant liniment. Baths containing arseniate of soda are sometimes highly beneficial. Mercurial plaster and sulphur ointment with iodide of potassium are good local applications. Cod-liver oil should always be given, and the bowels kept open by gentle salines. In women the menstrual function must always be considered. Colchicum is worse than useless, alkalies nearly as bad. Iodide of potassium sometimes does good. Hot mineral waters, as those of Bath, Buxton, and Teplitz, are perhaps the most promising means of cure.

GONORRHŒAL RHEUMATISM.

This is a peculiar malady, in no way allied to the former, save in the site of the affection, which is most frequently the knee-joint. As its name implies, it is commonly associated with urethral discharges, and one attack strongly predisposes to another. Sometimes it becomes chronic, the urethral discharge in a fashion alternating with the joint affection, so that as the discharge seems to get well, the joints become affected. With each subsequent attack the malady gets more and more intractable. Early in the disease the joints are a good deal swollen; latterly they may become anchylosed, or the cartilages may be destroyed.

Treatment.—It is desirable, should this malady make its appearance, to cease any attempt to arrest the urethral

discharge. The bowels should be freely opened by saline purgatives, and the joints kept absolutely at rest by a splint. Hot fomentations commonly give great relief. As soon as the swelling begins to subside, gentle friction with slightly stimulant liniments, helps to clear off the effusion. The best remedy in the acute stage seems to be the Turkish bath; if this is not attainable, local vapour-baths may be had recourse to. If the malady tends to become chronic, iodide of potassium in 10-grain doses and cod-liver oil must be employed. Tonics, especially iron, must be given as the malady disappears. Every precaution should be taken to prevent recurrence.

RICKETS.

Rickets is a malady of childhood, due almost invariably to imperfect nutrition depending partly on improper food, partly to want of digestive and assimilating power. The constitutional state manifests itself by certain signs early in the history of the malady, but the most essential characteristics are a softening or rather non-solidification of the bones, with bending and distortion, and peculiar changes in some of the internal organs. The softening of the bones is due to an excessive proliferation of the tissues wherefrom these are developed—*i.e.*, the periosteum and cartilages. These do not harden as they ought, but remain soft and uncalcified, whilst the bones seem to grow in size. At the same time the natural absorption is going on within the shaft, and so ultimately the bone becomes soft as putty.

The symptoms of rickets first manifest themselves about the period of dentition, or later, when the child begins to walk; more rarely at a still later period in the child's history. First, the bowels tend to get out of order, sometimes they are confined, more frequently loose, and the stools are particularly offensive—of a dirty brown colour, or even darker. The belly is usually swollen, the skin is hot, and the child drowsy but sleeping little. It becomes dull and languid, but peevish and irritable. It prefers to sit or lie about rather than to play, and even seems too fatigued to be amused. Among the first signs, however, of the approaching mischief are a tendency to profuse perspirations, especially on the head and face, whilst the rest of the body is burning hot, especially in the night. These

perspirations often appear during sleep, or after the slightest exertion, so as to run down the face. The vessels on the head are large and blue. The child eagerly desires to keep itself cool, and throws off the bedclothes, even at night and in cold weather. One of the most striking indications of the commencement of changes in the bones is pain, and still more tenderness in them. Any movement, voluntary or otherwise, seems to produce pain. The child will cry on being moved, or even on the approach of any one to move it. When the changes in the bones begin, the ends of the bones enlarge, and this is best seen where the integuments are thinnest—*i.e.*, on the knees and elbows, the wrists, and junctions of the costal cartilages. The face appears broader and squarer than it should be, the forehead seems unusually prominent, and the fontanelles are often late in closing or unclosed. This is due to the bones remaining or growing soft, whilst the brain itself continues to enlarge. The bones of the face remain small and puny. The spine too bends, so that the face is turned upwards and the head backwards, whilst the head sinks between the shoulders from inability to keep it erect. The spine also bends in the dorsal region—this time backwards; but if the child can walk, there is a compensating curve forwards in the lumbar region. Here the natural curves are only exaggerated, but sometimes there is also lateral as well as antero-posterior curvature. The ribs too alter their shape. Behind they are flattened and form an acute angle as they turn forwards; at the sides they are flattened, or even drawn in, whilst in front the sternum is pushed forward so as to give the characteristic appearance termed pigeon-chest. Whilst the bones too are in this soft state, they are visibly drawn in at each inspiration, save where they are resisted by some solid organ like the heart, spleen, and liver.

The curvature of the spine is partly due to changes in the bones themselves, partly to weakness and inability of the muscles to keep it erect. For the same reason in advanced cases, where the child has ceased to have the power of walking, if it ever possessed it, it commonly sits, supporting itself by its hands, leaning forwards and as immobile as possible, moving only its eyes in looking about. The long bones apparently suffer first: they soften and bend, giving way in the direction of greatest pressure; but such bones as the clavicle also become distorted, and what is of still greater consequence in

females, the pelvic bones become misshapen. Most frequently the spine is thrust forwards, and the antero-posterior diameter of the pelvis is diminished; but sometimes, if the thigh bones are pushed inwards, we have instead increase in the antero-posterior diameter, and diminution of that from side to side. The teeth are never very perfectly developed (often at the age of twelve months none have appeared), and they decay early. If therefore we see a child nine months old with no teeth, we should inquire the reason. The body is often covered with a mouse-like downy hair. The intellectual powers are deficient; though to a superficial notice such children seem precocious, in reality, though "old-fashioned," they are of poor intellectual capacity.

In many cases, with good food, air, and attention, these children improve to a marked degree, but often this does not happen until the bones have been permanently bent and the child disfigured for life. These deformities are, however, it must be remembered, accidents, so to speak, in the disease: the bones become softened by a pathological process, and then the influences of weight and pressure give them a definite set in some special direction. When death occurs, it is most frequently due to intensity of the malnutrition, either directly, which is rare, or indirectly, which is much more frequent. Lung mischief, especially catarrh, coupled with the imperfect respiratory motion, is a serious matter which occurs only too frequently and often causes death. Convulsions too are a serious mischief, to be sincerely dreaded. Among the frequent causes of death is chronic catarrh of the alimentary canal, giving rise to enlargement of the lymphatic glands. The spleen may contain "albuminoid" deposits. Laryngismus stridulus is common in such children, who may die of it or the consequent convulsions; but persistent diarrhœa most commonly is the ultimate cause of death.

Treatment.—As rickets, though perhaps partly due to inherited taint in one sense, since such children are most frequently the last of large families, where the mother is of necessity badly nourished, are mainly caused by improper food, especially in infants brought up by hand, or by prolonged suckling by an impoverished mother, care must be taken to insure good food. Animal food is especially important, and nothing suits young children better than raw pounded or grated meat, for since their teeth are so often bad, they cannot chew well. If this cannot be [illegible], let them have plenty of meat-juice, got by squeezing

meat, or what runs from a cut joint, or the essence of meat (*not the extract*). Cod-liver oil or some other form of fat is all-important, and should be given either by itself, or along with, or just after food. If the mother's milk is poor, it is best to have a wet-nurse, where practicable; where not, then good cow's milk diluted with water, and a little sugar added, should be given. If the child be older no dilution may be required, but on the contrary, the addition of cream or cod-liver oil may be necessary. Farinaceous food must always be given with caution. Next in importance to food comes clothing: this should always be warm and dry, so that exposure to a current of air can be borne. Fresh air is also an essential requisite, and sponging with cold or cool water is a valuable adjunct. The bowels are best regulated by small doses of the compound rhubarb powder, to which a little soda may be added. This may be given in small quantity even if the bowels be loose, but then chalk and bicarbonate of soda seem generally to suit best. A small dose of castor-oil is often useful. On the whole, grey powder is better avoided. Of remedies, steel wine, or Parrish's syrup, are perhaps the best. Reduced iron is also valuable. Lime water should always be added to the milk used, and should be given at least twice a day. A change of air, if judicious, does great good.

TRUE LEPROSY.

This disease, technically known as Elephantiasis Græcorum, is rarely if ever seen in this country save where it has been imported, though formerly it was not infrequent. The exact cause of leprosy is not certain: it seems to be hereditary, and it undoubtedly is aggravated by bad food, personal uncleanliness, intemperance, cold, and damp. It generally appears between ten and forty, and is more frequent in males than in females. It does not seem to be contagious.

Two forms of the malady occur: the one marked by tubercles in the skin, hence called *tuberculated;* in the other are no tubercles, hence it is called *non-tuberculated.* This latter variety is characterized by white spots or blotches on the surface of the body, which are devoid of sensation, and hence sometimes it is spoken of as *anæsthetic leprosy.* The malady sometimes comes on with feverish symptoms, but there may be no fever, and the first sign

of the malady may be one or more red spots, sometimes on one part of the body, sometimes on another, most frequently on the ankles or scrotum. The tissues beneath these spots become hypertrophied, so as to form a slight swelling, and the skin, more or less infiltrated, assumes a brawny hardness, and becomes brown in patches. These appearances gradually pass away, leaving scar-like spots, though there has been no broken skin. The face becomes swollen and bloated, the mucous membranes become pulpy-looking, and there is a discharge from the eyes, mouth, and nose. The lymphatics also enlarge, and a peculiar greasy sweat is exuded from the body. The nerve trunks are swollen, and there may be a good deal of pain. In the non-tuberculated form one or two shining spots paler than the surrounding skin appear and gradually spread. These spots are quite insensible. Ultimately horrible but painless ulcers form on the extremities. The surface is cold, and the fingers and toes look glazed. In the advanced stage, joint after joint is exposed and opened, and bone after bone drops away; the extremities become fearfully distorted and quite useless. The mind is blunted as is bodily sensation, and the discharges are horribly fœtid. Death commonly happens from some intercurrent malady, as diarrhœa or pneumonia.

From *treatment* not much is to be expected. Recently a system has been introduced in the West Indies which has been well reported on, but the author of it has died, and it will probably come to nought. The local application of cashew-nut oil constituted an important part of it, and good food was another. A healthy airy abode is essential. Baths seem to give some promise of relief. Cod-liver oil, quinine, and iron, with Glauber's salt as a purgative, seem to do some good. Arsenic has been highly spoken of. Most cases terminate fatally, though some do get better. What advantage has arisen from the administration of drugs in these remains doubtful.

The other form of elephantiasis (Elephantiasis Arabum) seems to be due to some obstruction to the backward flow of blood or lymph, causing a hypertrophy of the part or organ concerned. The connective tissues are those chiefly concerned. The upper and lower extremities are the parts most frequently attacked, and become more or less useless. Iodine and quinine and iron seem to promise best as remedies.

DIABETES MELLITUS.

The term diabetes or diabetes mellitus is applied to a group of symptoms, foremost among which is an excessive formation of sugar within the body, and its elimination by the kidneys, giving rise to a greatly increased flow of urine. It is a question whether or no sugar is a normal constituent of the urine, but undoubtedly it may make its appearance there in small quantity, and for a limited period, under various conditions, among which we must reckon the inhalation of chloroform, and the occurrence of various convulsive diseases. But it is only when the presence of sugar in the urine is persistent, and gives rise to certain other well marked phenomena, especially profuse flow of urine, thirst, and emaciation, that we consider the condition as diabetes. Again, there are great diversities in diabetes. We have severe cases, where the wasting is speedily and strongly marked, whilst in others, especially in patients somewhat advanced in life, this is not nearly so well marked. We have diabetes of a severe type, and of a mild type.

The theories as to the nature and origin of diabetes are numerous, but as we do not know that any one of them is right, little need be said regarding them. This only we do know—that in the liver is produced a substance called glycogen, closely allied to, and readily converted into grape sugar, and that this glycogen though most readily formed with a mixed diet containing plenty of fat and starch or sugar, is nevertheless capable of being formed with a purely meat diet. Under ordinary circumstances neither glycogen nor sugar can be detected in any quantity in the general blood current. When from whatever cause this happens we have the foundation of diabetes, for the sugar is then eliminated by the kidneys, and this constitutes symptomatically the essence of the disease.

Diabetes is far more common among males than females, and in the young than the old, but it is rare both in childhood and old age. Women, who are prone to it at an earlier period than men, after forty seldom become its subjects. Diabetes sometimes tends to run in families, but heredity is not a marked characteristic of the disease. The more immediate causes of the disease, if they can be called such, are very various—exposure to cold and wet—mental emotion and anxiety—

eating too much sugar, and injuries to the head, or diseases of the brain, all seem in certain instances to give rise to the mischief. Nor do the post-mortem appearances in those who are cut off accidentally while diabetic, help us to any explanation of the cause and origin of the malady, except where the brain is affected in the neighbourhood of that spot, which being injured gives rise to saccharine urine. The liver is sometimes larger, sometimes smaller than usual; sometimes it is hyperæmic, sometimes the reverse. The pancreas is sometimes larger than usual, often atrophied. The kidneys are generally enlarged and congested, sometimes altered as in Bright's disease. The spinal cord and brain sometimes show signs of shrinking and atrophy. But there is nothing to give us a clue as to the nature and cause of diabetes.

In most cases the mischief comes on very gradually, and is usually detected accidentally or incidentally. The patient complains of gradually failing strength; emaciation—notwithstanding a voracious appetite and plenty of food—thirst, and a great tendency to make water. He goes to a practitioner who finds the clue to the secret in saccharine urine. The quantity of urine passed is much greater than normal, often as much as fifteen or twenty pints a day. Its colour is light, it looks limpid, smells sweetish, and froths freely. Its specific gravity is high, usually about 1040, but rising and sinking with the diet used. If the patient be allowed to drink freely the quantity passed is just about the same as that drunk; but the withered appearance, and dry rough skin, indicate a tendency to the removal of more water from the body than is consumed in any one day. The increase in the specific gravity of the urine is mainly, but not entirely, due to the quantity of sugar passed, but the total urea is also increased, though from the enormous quantity of water its relative proportion seems diminished. The quantity of urea is usually determined by Liebig's process with the nitrate of mercury. It usually amounts in diabetes to 600 or 700 grains in the twenty-four hours, whilst in a well-fed, healthy individual the quantity rarely exceeds 450 grains. Nevertheless it is a curious fact that the bodily temperature of the diabetic is generally a degree or so below that of health.

The existence and the quantity of sugar in the urine may be detected by one and the same process, but it is usual to make use of a rougher process for ascertaining the actual presence of sugar in the urine. A rough test

is that commonly known as Moore's test. It consists in boiling the suspected urine with an equal bulk of liquor potassæ, when if sugar be present the liquid is darkened to a blackish-brown colour. As a trial test this is a very convenient one, but it is very uncertain, and a dark colour is readily produced with deep-coloured urine when there is no sugar. A far more certain test is that of fermentation, which also suffices for quantitative analysis. Two quantities of urine are taken and their specific gravity accurately noted. To the one a lump of German yeast, the size of a marble, is added, to the other nothing. They are put aside, lightly covered, in a warm place, for four-and-twenty hours, when fermentation in the one containing yeast will have been completed. Again the specific gravity of the two should be carefully taken and compared, when in the fermented one, owing to loss of sugar and formation of alcohol, the density will be found to have fallen very greatly, it may be even to something less than that of water. For every degree of specific gravity lost we may calculate the existence of a grain of sugar in each ounce of water passed. Thus if the density before fermentation is 1040 and after fermentation is 1010, the difference being 30, shows that each ounce of the patient's urine contains 30 grains of sugar. This exceedingly valuable and simple method is known as the Fermentation or Roberts's test, from its inventor Dr. Roberts, of Manchester.

The method of detecting sugar most frequently had recourse to depends on the power of grape sugar or glucose, which is the kind of sugar contained in the urine, to reduce an alkaline solution of copper to the condition of red suboxide. Two methods are employed, one called Trommer's, the other Fehling's, the latter being available for quantitative analysis. To test urine by Trommer's method we add to a small quantity of urine in a test tube a drop or two of a solution of sulphate of copper. To this an excess of liquor potassæ is to be added, and a spirit lamp applied so as to heat the uppermost stratum of fluid, leaving that near the bottom of the test tube comparatively unheated. If sugar be present the red suboxide is formed by the heat, and this will contrast forcibly with the bluish-green solution at the bottom of the test tube. It is far better, however, to use Fehling's method. First of all a solution of copper is prepared thus: We take sulphate of copper, gr. 90½; neutral tartrate of potash, gr. 364; solution of caustic soda

of specific gravity 1·12, four fluid ounces: distilled water sufficient to make the whole up to six fluid ounces. This solution is also adapted for quantitative testing, since 200 grains of it are exactly decomposed by one grain of grape sugar. If albumen be present, that must be removed by boiling and filtering before testing for sugar. This Fehling's solution does not, however, keep very well, and so it is best to keep the solution of copper in one bottle and the alkali in another. We may, however, keep them mixed if we always adopt the simple precaution of boiling the test solution before adding the suspected urine, for if any red oxide is thrown down before the urine is added, it shows the test solution to be no longer reliable. The test solution must always be used in *excess*, and the whole allowed to cool before we can pronounce absolutely on the presence or absence of sugar. As sugar has the power of deflecting a ray of polarized light to the right, this property has been taken advantage of to produce an instrument capable of estimating the quantity of sugar in the urine by optical means.

The quantity of sugar thus detected varies greatly according to the nature of the case, from an ounce or so to a couple of pounds or more in the twenty-four hours, the average quantity being from a pound to five-and-twenty ounces. It also varies with the period of the day, being most plentiful after a meal, and with the kind of food, being always greatly augmented by starchy or saccharine diet, whilst it is diminished by the occurrence of acute disease. Thirst and hunger are almost always prominent symptoms. Patients drink enormously, but the drink does not relieve their thirst, which is probably due to the large quantity of sugar circulating in their blood and in their tissues. It is important to understand that the water drank is not the cause of the great flow of urine, though the great flow of urine may cause the thirst. A voracious appetite, especially for forbidden articles of diet, is a marked phenomenon in diabetics. But notwithstanding the water drank and the food consumed, the surface is dry and harsh and the bodily substance wastes. First of all the fat goes, but latterly the other tissues also waste, as is indicated by the large quantity of urea excreted. Besides dryness of the skin, such patients often suffer from boils, both large and numerous and very painful—psoriasis too is common. For some reason—it has been said from transudation of fluid owing to the great density of the blood—

cataract is not uncommon. The urine passed is irritating, hence there is much smarting, especially in the female, about the urinary passages. The gums shrink, and the teeth slacken and become carious. The tongue is red and clean, but dry. Digestion is imperfect after a time, and there is almost always constipation. When diarrhœa occurs, as it is apt to do in the later stages, it soon carries the patient off. There is great mental and bodily prostration, the patient being quite indisposed for any exertion. Their mental characteristics too are striking: they will lie and steal, and their statements as to food and drink can hardly ever be relied on. This too in men who were previously honourable in every respect. Impotence is marked in the advanced stages of the disease. Sooner or later diabetes tends to death, but in most cases the course is a chronic one, equable on the whole, but also presenting signs of occasional but deceitful amelioration. This is especially so in older patients; broadly speaking, the younger the patient the greater the tendency to rapidly fatal results.

When the disease is uncomplicated, the patients gradually die of exhaustion, but even in these the end is abruptly brought about by something like a uræmic condition, with coma, or convulsions. But by far the larger proportion die of some complication or another. Foremost among these is phthisis, due rather, however, to pneumonic than to tubercular deposits, and so, in a good many cases at least, beginning first at the base of the lung. When we come to examine the lung we often find it equally manifested in the apices, but if carefully watched, the first indication of lung mischief will often be found at the base. But even before any physical signs of phthisis are available, we have an unfailing indicator of what we have to dread in the thermometer. As already pointed out, the temperature in diabetes tends to sink below the normal; if therefore we note a persistent or steadily recurrent rise above the normal, we may be on the outlook for lung mischief. But other parts of the body share in this tendency to destructive inflammation. Boils and carbuncles are exceedingly common phenomena in the course of the malady. Other tissues, especially the serous membranes, are apt to be attacked also. Gangrene of the lower extremities sometimes occurs, and even the lungs may become gangrenous. Loss of vision is not uncommon. Sometimes it is merely a temporary blindness or

dimness of sight, but in others it is permanent and due to cataract. The occurrence of cataract in diabetes may be taken as a sign that the disease is well advanced and the end not far off. Any attempts at operation succeed very badly.

Treatment.—Notwithstanding that the prognosis in diabetes is exceedingly unfavourable, much may be done to retard the progress of the disease, and in some instances to completely remove the sugar from the urine. In a certain number of instances regulation of diet is sufficient to make the sugar disappear from the urine. In no case does treatment of any kind promise much without attention to it; for, as we cannot stop the formation of sugar in the body, we can only try to arrest the supply of sugar-forming material. To this end we must stop bread and potatoes as articles of diet, and try to make up for their loss by a more copious supply of meat. Among tribes of hunters such a diet is the normal one, and suffices to keep them in robust health; but it is curious that among them, fat, also a hydrocarbon, is consumed as we would bread, along with the leaner flesh. Flesh therefore must constitute the main diet, and what form is used does not greatly matter. Any form of butchers' meat, game, fish, poultry, cheese, eggs, may all be freely used along with green succulent vegetables, cooked at one meal, raw at another. Milk too has been prescribed, but recent experience shows that though it does not suit some, it is valuable in others. Those who advocate milk reject fats and oils. This too is a mistake, for frequently they are consumed by the patient with great gusto and with decided advantage. Vegetable soups, so long as they contain no potatoes, are often relished, relieving both thirst and hunger. But to keep up the restricted diet of diabetes is exceedingly irksome, and it requires the closest possible watching when patients are put upon strict diet to prevent them from stealing and consuming bread by stealth, persisting in the most barefaced manner that they have done nothing of the kind. To obviate this, some men allow a small quantity of toasted bread to be used, acted on by fire so that most of the starch is destroyed, and even this is greatly relished by the diabetic. Besides this, bran bread, gluten bread, and almond bread are all used, and may be substituted the one for the other as the exigences of the case require, for it is of the first importance to persist in the treatment as long as possible, and to this end the

likings of the patient must be borne in mind. All substances containing starch or sugar must as far as possible be forbidden, but to this, as indicated, there are limits. The drink of the patient should be water, or cold tea or coffee without sugar. Malt liquors and strong wines do harm; on the other hand, light wines, mixed with the water drunk, notably tend to diminish thirst and promote comfort. Cream of tartar water (without sugar) flavoured with lemon is a good drink. Some prefer more acid substances, but beyond acting as flavouring agents these are hardly to be commended. Clothing must also be looked after. A moist skin is of the first importance. A cold on the chest may be deadly, therefore let the patient live day and night in flannel. When once such a complication as phthisis has developed it is useless to fight any longer with a sternly restricted diet, but if something be not done to regulate it, the inevitable end will be greatly hastened. It is curious, however, to note that latterly in diabetic phthisis the sugar often disappears completely from the urine. Judgment must be used in such cases, and each dealt with on its own merits.

As to medicinal agents, these are mainly two in number—opium and alkaline salines. Opium is the most important remedy, and must be pushed to the verge of narcotism, gradually increasing it until a large quantity is being taken daily. Very large quantities can be taken. We have known as much as ten grains of the extract of opium taken every four hours without anything but benefit, the skin getting soft and perspiring freely, the urine falling in quantity, and diminishing in specific gravity. But individual cases do occur where there is no such tolerance, and it has to be discontinued. The best form of alkaline saline is that contained in Carlsbad and Vichy waters, there being unmistakable evidence of the efficacy of these, especially the former. The other remedies which are of value are mainly adjuvants, such as laxatives for the obstinate constipation, cod-liver oil and iron where there is much bodily waste going on and the like. Liq. potassæ in calumba is often very valuable as a tonic, and some harmless form of stimulant seems useful in the same way. It is to be added that in a certain number of cases rennet has proved a remedy of value. Most others are valueless.

ADDISON'S DISEASE.

Addison's disease is a badly understood condition of mal-nutrition associated with a tendency to cheesy or cretaceous change in certain parts of the body, especially in the suprarenal capsules.

The disease comes on most insidiously, and its most marked sign is usually a bronzing of the skin, so that the patient may be as black as a Mulatto or Hindoo, though originally quite white. In other cases there is less of the brown in the alteration in colour, which tends rather to a greenish-black. The parts which tend to become most deeply pigmented are those where the normal pigment is most abundant, especially about the genitals, the eyelids, and mammæ, but the alteration is not confined to these. Indeed, black spots may be formed on the lips and inside of the mouth, where they may be said to constitute unmistakable marks of the disease. The first constitutional signs are weakness and dejection of spirits. The patient stands in a listless attitude with the shoulders thrown forwards, and with the hands dangling by the sides. The pulse is small and feeble, the heart sounds hardly audible, and the appetite gone. Often, too, there is nausea, and the food is vomited even when taken. The breathing is wavy, the least exertion induces breathlessness. Fainting attacks are common, and the temperature is depressed. Pain in the epigastrium is often complained of, sometimes also in the loins. There is often giddiness and dimness of vision from the bad cerebral circulation; hence, too, the apathy. Usually the patients die quite suddenly—they faint and do not come round again. In some cases severe and obstinate diarrhœa hurries on the fatal issue, for this, as far as we know, is invariable. After death the pigmentation, which may have been overlooked during life, especially if patchy, is better seen. Sometimes, indeed, the nature of the malady has only been then discovered. If the surface has been irritated, as by a blister, that part is invariably darker than the rest of the surface. But in all cases the sclerotic and the lunula at the base of the nail remain white, and even more than usually pearly. Internally the most important changes are in the tissues of the suprarenal capsules. Rarely have these been found in a condition of active change, usually they are enlarged and irregular in shape, and firmer in consistence than natural.

Sometimes they are adherent to the surrounding tissues. On dissection they are usually found to be cheesy, greyish-white, or yellowish in colour with a tendency here and there to cretify—more rarely they have been found to contain a similar matter broken down, or to consist mainly of connective tissue and some cholesterin. Frequently, too, similar cheesy or cretaceous masses are to be found elsewhere, as in the lungs and prostate.

As to the causation of this disease little can be said. Many symptoms, however, point to a grave affection of the sympathetic nerve, especially the condition of the respiratory and circulatory organs, and the nausea and vomiting. The close connexion of the suprarenal capsules, with the great sympathetic abdominal plexus, is in this respect worthy of attention.

Treatment.—Heretofore this has been useless. Cod-liver oil, wine and good food, often seem to do good for a time, especially if the mischief be very chronic, but sooner or later it makes way again. Warmth is to such patients very important, as they have little heat-generating power. Beyond such general directions, the only thing is to treat symptoms as they arise—cough, nausea, vomiting, purging, as the case may be, but we need hope little of the malady itself.

HEATSTROKE—SUNSTROKE—HYPERPYREXIA.

Sunstroke, more appropriately called heatstroke, is a disease better known abroad than in this country, where it is not often seen save in the extreme heats of summer. It is by no means necessary, as its other name *insolation* would seem to imply, that the patient should be exposed to the direct influence of the sun's rays, especially if the subjects have been much fatigued. Hence it is that the so-called sunstroke often occurs at night in warm sultry weather, and where there is overcrowding. Soldiers, who have most frequently been the subjects of this malady, have usually also laboured under the disadvantages of a tight-fitting dress. The abuse of stimulants also powerfully conduces to a fatal result.

Perhaps it might be most justly said that we have practically to deal with two forms of disease. One we might well call sunstroke, occurring as it does during direct exposure to the powerful rays of the sun. In such the symptoms are rapidly developed, and death as rapidly

follows. The patient falls, gives one or two gasps, and dies. The other, to which the term heatstroke is more applicable, comes on more gradually. It occurs very often at night, after fatigue or indulgence in spirituous liquors, especially in close confined places, where there is little ventilation or other means of reducing temperature. Here too we often have warning of the approach of the malady, especially in the arrest of perspiration which occurs. At the same time the temperature rises to above 105° Fahr., and there is a great tendency to pass water. The heat of the skin is stinging in quality, and there is frequently nausea. The breathing is quick and noisy, the pulse quick and very weak, finally irregular and intermittent. Death follows by coma or convulsions. Now in all this we have an exact picture of what we call hyperpyrexia as it occurs in rheumatic fever and such like maladies. And in this fact we have a clue at once to the pathology and treatment of the condition. In sunstroke, properly so-called, we may have no time to act at all, but in it the same principles should guide us.

Treatment.—Heatstroke is essentially a condition of blood-poisoning, where overheated blood is the poison. Like other conditions, it is best avoided. To this end in very hot weather men should abstain from exposing themselves to the direct heat of the sun, should wear light, loose clothing, and have their heads well protected by a thick umbrella or appropriate hat. Stimulants are better avoided, and the skin should be kept open. If the body becomes overheated, the skin dry and pungently hot, a cold bath should be immediately had recourse to, till the bodily temperature has fallen to its normal limit. The cold douche should be assiduously applied to the head and spine, or ice may be applied to the same parts. Rubbing the body with ice may be necessary. Injections of ice cold water should be tried, and, as soon as the patient can swallow, ice should be given.

In slight cases the wet sheet will probably suffice.

Sunstroke often leaves serious mischief behind it. For this there seems but one remedy—rest in a cool climate. Headache is often troublesome: for this the head should be shaved, and kept cool, and bromide of potassium tried, whilst the skin is kept open and the digestion attended to. Often a judicious hydrotherapeutic course is the best remedy.

GENERAL DISEASES.

(B).—ACUTE INFECTIOUS DISEASES.

Besides the class of general diseases already discussed, and which seem to depend on imperfect nutrition, or undue exposure to unfavourable influences, there is another group most of the members of which are characterized by very distinct symptoms, and which appear to be due to the influence of a definite poison, the nature of which differs in each particular instance. Most of these maladies are characterzied by a high bodily temperature, whence it is common to speak of them as *fevers*. Moreover, they tend not infrequently to invade great masses of the population nearly at the same time—*i.e.*, to become *epidemic*. Others again are constantly to be found in some particular district, where they are said to be *endemic*. In a certain fashion the disease called enteric or typhoid fever may be said to be intermediate in characters between this group and the former. A description of it may therefore well be taken first.

ENTERIC FEVER.

The disease called *enteric or typhoid fever* was, up to comparatively speaking a recent period, confounded with that called *typhus*. It is nowadays sometimes called *abdominal typhus*, or *ileo-typhus*, from the chief site of its characteristic lesions. It is also called by some *gastric fever*.

The most important sources of infection, in this malady, are undoubtedly air, and water, polluted by sewage. But it is not quite clear whether contamination of air and drinking water with sewage alone is sufficient to originate the disease *de novo*. Recent investigations go far to render it probable that the water supply of a place may be long contaminated with sewage, and no typhoid follow

until typhoid dejections, in some way or other, find their way with the sewage into it, when the disease promptly makes its appearance. Recent investigations also go to show that milk, diluted with impure water, or conveyed in tins washed with impure water, is frequently the means of spreading the malady. Undoubtedly the discharges, from the bowels of typhoid patients, are the chief source of infection, and hence ought to be carefully destroyed. Infection by the exhalations of the skin and lungs of such patients is doubtful, whilst in true typhus this seems to be the rule. Sewer gas, or other product of putrefaction carrying with it typhoid germs, seems in many instances, to give rise to enteric fever.

Typhoid is essentially a disease of early life, and no doubt constitutes the malady which used to be called infantile remittent. It seldom attacks people advanced in life. Typhoid too is an endemic malady; when apparently epidemic, we must look for some local mode of origin, as a polluted water or milk supply, or the inroads of sewer gas laden with typhoid germs. Males are equally subject to it with females, and strong, healthy individuals are, if possible, more liable than weakly ones. Certain other maladies seem to give a kind of immunity from it. Neither overcrowding nor destitution predisposes to enteric fever. In point of fact, it is almost as frequent among the upper as among the lower classes, but it is liable to spread more readily among the latter than the former. It is, moreover, more frequent in warm than in cold weather, and occurs most abundantly in autumn, especially if preceded by a dry summer.

Ordinarily there is a period of incubation in enteric fever, lasting for about fourteen days from the time of infection, though the patient often cannot give any exact date as to the onset of the malady; but sometimes he seems struck down with the poison at once. This, however, is rare in typhoid though the rule in typhus. During this period the patient feels ill; he suffers from languor, lassitude, headache, and pain in the back and limbs; the sleep is disturbed, the appetite gone, and the bowels irregular, tending to looseness. There are alternating chills and heats, but the skin is always very hot at night, getting cooler towards morning. Often there is bleeding at the nose. The first chill, when such has been made out, is accounted the onset of the fever. The bowels are frequently constipated at the beginning, and *may remain so throughout the attack*, though this is rare

Diarrhœa generally sets in during the first week of the malady. There is not so great prostration as in typhus. The patient's appearance and expression in bed may not seem to be much altered, or the cheeks may even be flushed; but if he has been sitting up he looks pale and pinched. The tongue is covered with a thin fur, the papillæ projecting, and the whole coated with a tough glairy mucus. This usually falls off before long, leaving the organ smooth and red, afterwards assuming a brown baked look. This change usually begins in the middle and at the tip, so that there is a central red strip which tends to become dry and brown, and a patch of coating on either side. The tip and edges are red. Nausea and vomiting are of frequent occurrence. The abdomen soon begins to enlarge in some, and becomes tense, tympanitic, and painful on pressure; frequently there is gurgling in the right iliac fossa. As a rule there is diarrhœa. The spleen is also enlarged, and the temperature rises regularly, but with daily remissions. Commonly there is a difference of one, two, or more degrees between the morning and evening temperature, so that if the morning temperature is 103°, the evening will be about 104° or 105°. The initial rise of temperature, which amounts to about one degree a day higher than the preceding day, usually ceases after the first week. The pulse is usually over 100, and does not bear any distinct ratio to the fever. It is easily excited, and varies considerably from time to time. Sitting up in bed, for instance, speedily quickens it. The pulse often beats double (*dicrotous*) in bad cases. The respiration is quickened, and sometimes irregular. The urine is scanty and high coloured, and the quantity of urea is increased. The chlorides are diminished, and there may be slight and temporary albuminuria.

About the end of the first week or beginning of the second, some small rose-coloured spots usually begin to appear. They are first observed over the chest and abdomen, and may never be seen elsewhere. They are not invariably present, but are to be found in most cases. They disappear on pressure, and come out in successive crops.

During the second week of the attack, or even earlier, the patients are often delirious, and theirs is a busy delirium; they are restless and can hardly be kept in bed. Later, in some instances, this is succeeded by a more apathetic condition, and the intellect becomes clouded. By this time, too, it is common to have considerable

diarrhœa, and often this prevails from the first, from three to ten stools, or more, being passed in the twenty-four hours. These stools are liquid and peculiar in appearance, —yellow, pea-soupy or ochry. They are alkaline, often contain the triple phosphate, and exceedingly fœtid. At this time, too, the belly is commonly swollen, and the patient suffers from meteorism. After the first week, and as the disease progresses, the temperature is usually high (104° F.), and the pulse quick. The dependent parts of the lungs frequently become congested. The debility is very great, so that the patient seems huddled together in the bed, and there is a great tendency to bed-sores. The patients are or seem to be somnolent or insensible, the pupils are dilated, and the sphincters are often paralysed, so that the motions are passed involuntarily. There is also risk of over-distension of the bladder. Tremors and muscular twitchings are sometimes observed, particularly in the advanced stages. Convulsions are rare. In the third week the case may terminate fatally, or the patient may after about twenty-one days begin to recover, but only gradually.

The first sign of improvement is usually sound natural sleep, from which the patient awakes conscious, but desperately weak, and in the morning there is a marked fall of temperature. The daily fluctuations, however, continue considerable for some time. The pulse also falls and becomes fuller. The course of convalescence is slow, and there is always considerable risk of relapses, so that patients require careful management.

There are certain very serious risks to be run in typhoid. One characteristic feature of the disease is swelling and infiltration of the intestinal glands, especially of those constituting Peyer's patches. As a result of this there is diarrhœa; and sloughing or ulceration, whence arise two dangers—hæmorrhage and perforation. This hæmorrhage may manifest itself suddenly, and equally suddenly terminate fatally. Still more fatal is the perforation ending in peritonitis. The mesenteric glands, too, are commonly enlarged. It is most important to bear in mind that the degree of these intestinal changes bears no relation to the intensity of the general symptoms, so that sometimes in people who have been well enough to be able to walk about, these accidents may suddenly terminate fatally.

As already pointed out, the lungs are liable to congestion. This gives rise to another danger, as bronchitis or pneumonia may supervene. The matters expectorated too

are unusually tenacious, and are with difficulty expelled. Such complications are among the most frequent causes of death, where the patient does not sink from the fever, or abdominal complication. When the vital powers are at their lowest, thrombosis is not infrequent. In case of death the most prominent lesion is the ulcerated patches of all sizes and shapes in the jejunum and ileum; if earlier, the enlarged glands are seen; if later, perhaps the ulcers are in course of healing. When the patient recovers, no contraction follows cicatrization of these intestinal ulcers. Frequently the intellectual powers of the patient remain for some considerable time at a low ebb, even after apparently complete convalescence. The hair usually falls off, gradually or suddenly, but it grows again of its own accord. There is often slight desquamation of the cuticle. If there be any predisposition to tubercle, there is always risk of its development during convalescence from typhoid.

Treatment.—As enteric fever is a malady which runs a definite course, we cannot hope to do much, in the way of treatment, to arrest the malady; but very much to ward off the risks threatened by intercurrent maladies. On the other hand, as its cause is approximately well known, much may be done to prevent its occurrence. This last is to be accomplished by attention to hygienic rules, especially the removal of all risk of poisoning by sewer-gas, or by sewage contamination in drinking water, so that a pure water supply, and efficient means for getting rid of sewage are essential. So too as the typhoid stools are undoubtedly the main source of contamination, they should be effectually disinfected, or completely destroyed. Powerful disinfectants, as carbolic acid, should be used for this purpose, and the stools received into a vessel containing such should be drenched with it as soon as passed, and certainly before being allowed to escape into drains or otherwise discharged. All bed and body linen should be disinfected as soon as removed from the patient, and disinfectants freely used by the attendants when the patient, or his discharges are touched. Good nursing is almost more important in typhoid than in any other malady. Plenty of fresh air should be admitted, the room kept perfectly sweet and clean, and the patient's cleanliness rigorously attended to. Do what you will in some cases bed-sores will form, but every precaution must be taken to prevent their occurrence. Cleanliness is the great means of doing so; later, sponging the back with

alcohol often does good. The mouth, when the fluid matters begin to collect on the lips and teeth, should be well wiped out, when the patient is unable to do it himself. A weak solution of permanganate of potash is the best cleansing agent. Drink should be given in moderation, even when not asked for: pure water, or claret and water, or soda-water, are the best. Pure spring water can be taken longer than anything else.

The food must be good, and some skill is required in adapting it to the wants of the patient. Milk and beef-tea, or broth should be its basis; but it is questionable whether under certain circumstances solid but easily digested food, as raw pulped meat, is not preferable.

The temperature in typhoid is high and troublesome, sometimes it runs to the extreme of hyperpyrexia (see also Rheumatism), and when this is the case it must be artificially reduced by cold or tepid water baths: but in ordinary cases this is not necessary, and tepid sponging with light bedclothing and free ventilation is all that is required. Intermediate between the two plans is that of placing the patient in a bath a few degrees below his bodily temperature and gradually cooling it down by adding cold water till the temperature of 60° or 70° Fahr. is reached. With moderately high temperatures—102° to 104°—quinine may be used in doses of 5—20 grains.

When the lungs become affected there is considerable danger to the patient, our remedies not being very efficient. Carbonate of ammonia with bark may, however, be given in good full doses (5—10 grains). The inhalation of steam, when practicable, may also diminish the excessive tenacity of the sputa. But with the abatement of the fever comes the improvement of lung symptoms. If the bowels be confined it is not advisable to give any opening medicine in the earlier part of the disease, usually they open of their own accord. If necessary a small dose of castor-oil may be given, or a simple lavement of warm water used instead. Slight diarrhœa too is best left alone; if it prove excessive—more than two or three stools in the twenty-four hours—an enema consisting of an ounce of starch with ten or fifteen minims of laudanum is best. Small doses (gr. 5) of Dover's powder and Compound Kino powder are also useful. So is the lead and opium pill. When there is much flatus in the bowels, small quantities of turpentine (℥j—℥ij) may be thrown up the rectum by means of a long tube. If hæmorrhage comes on ice is to be given internally, and freely applied to the bowels. Small

quantities of ice cold water should also be used as enemata. Gallic acid (gr. 20) with sulphuric acid (♏ 10) should also be given, best as an electuary. Liquid extract of ergot in ten to twenty minim doses is also highly recommended. If perforation occur there is no great hope, but whatever that amounts to, rests in the prompt and free administration of opium, best given as enema by the bowel, or as morphia under the skin.

The bladder towards the end of the disease should be carefully examined and emptied if necessary. And at this stage, whether there be signs of sinking or no, wine must be freely given. When there are signs of sinking wine or brandy must be given at any stage of the malady.

The best plan of dealing with the malady itself throughout the greater part of its course is simply to let it alone. Some prefer giving small doses of dilute nitro-hydrochloric or hydrochloric acid in water, but others merely watch the case and deal with symptoms as they turn up.

In all cases there is a risk of relapse, so that the diet of the convalescent patient requires to be carefully looked after. In no case should a patient be dismissed, though otherwise apparently well, if there is a marked rise of temperature every evening, however low it may be in the morning. Occasionally such an indication is followed by even a severer secondary attack than the primary one. Change of air, with light bitters and mineral acids are strongly advised, and idleness for a time is imperative, when convalescence has fairly set in.

TYPHUS FEVER.

Typhus fever, which used in many parts of the country, and still does in some retain the name of "Fever" *par excellence*, is a well marked specific disease, usually occurring in epidemics, though often in the same parts endemic, highly contagious, and sometimes exceedingly fatal. Various names have been given to it to distinguish it from enteric fever, such as *exanthematic*, *spotted* or *petechial* typhus, and it constituted the well known diseases in times gone by called *putrid fever*, *camp* and *gaol fever*.

Typhus may occur at any age—chiefly between ten and thirty—but rarely proves fatal to the young. Hence it appears—from death registers—to be more prevalent among those somewhat advanced in life. Depressing influences, whether mental or bodily, such as fatigue, fear, and the like, strongly predispose to its attacks; hence it is

that squalid town populations, just above or hardly above the rank of paupers, are the chief sufferers. Destitution, overcrowding, and bad and insufficient food, if they cannot give rise to this fever, certainly greatly favour its ravages. Typhus is essentially a disease of cold or temperate climates, and it is most frequently encountered as a winter (January to March) epidemic. It is a vexed question whether typhus can be produced *de novo* by the causes already mentioned, but undoubtedly it mainly spreads by contagion, chiefly by tolerably close contact with the bodies of those who have become its subjects. Thus nurses in fever wards in hospitals rarely escape; medical men do so more frequently, and except in intense epidemics the better classes who dwell in healthy houses rarely suffer.

After exposure to the infection the disease may appear in its most intense form in a few hours, but generally it is some days (as a rule twelve) until it manifests itself. The first symptoms, which come on suddenly, are headache, loss of appetite, and general discomfort, amounting almost to pain, with more or less shivering. Very often the patient thinks to walk off his uncomfortable sensations, and finds to his surprise how weak he is. In all such cases the patient speedily must give in, and take to his bed, and the sooner he does this the better. About him there is a look of intense prostration: he appears dull and heavy, his face is dusky, his mouth, at first coated, becomes dry, and sordes speedily form on the teeth. He is restless at night, sometimes sleepless, the bowels are constipated, and the pulse quick. By the fourth or fifth day in most cases an eruption is seen, consisting of a mottling something like measles, of a dusky red tint, apparently situated beneath the skin, and dark mulberry spots more superficially. This commonly appears first on the backs of the wrists, and on the sides of the abdomen, and may be very variously developed, in some covering the whole body, especially the trunk and arms; in some not seen at all. The eruption very rarely appears on the face. The spots can hardly be said to be elevated, and though at first capable of obliteration soon cease to be so even on strong pressure. Only one crop ever appears. The mottling goes before the spots do. In some cases the "mulberry spots" may not disappear until the twenty-first day, especially when, as they often do, they become petechial about the tenth day. The worse the case the more marked the eruption. The tem-

perature is high throughout the disease, and reaches its maximum in the first week; it may then amount to 104° or 105°, or even more, especially in children. There is generally a remission about the seventh or tenth day, and in the second week it rarely runs to the height of the first. Again between the twelfth and fourteenth day there is another remission; and in average cases convalescence begins from this date. In fatal cases there is often a marked rise of temperature before death, and a rise where should come a remission, say about the seventh day, is of very evil omen. Defervescence is sudden and complete, and there is never so much diurnal variation as in typhoid. The pulse is quick, 100 to 120 or more, and may rise till it is not countable, especially in bad cases. It is peculiarly soft and compressible from the first, and may latterly be hardly perceptible. It is easily raised by any exertion, especially sitting up, and the heart's sounds, especially the first, are scarcely audible, and the impulse diminished.

The tongue, at first covered with a creamy fur, soon becomes as dry as a chip, and sometimes resembles a black shrunken ball, a sure mark of a bad case. This may crack and bleed, giving rise to a blackened and crusted appearance of mouth. The mouth itself is also dry, and thirst is a constant symptom in the early part of the fever. There is no appetite, and no digestive power. Vomiting and diarrhœa may also occur, but as a rule the bowels are confined, and the stools dark or high coloured. Occasionally there is tympanites. The breathing is quick, sometimes jerking or irregular. From the general prostration there is a tendency to hypostatic congestion of the lungs. This, indeed, may almost be considered a symptom of the disease. It comes on insidiously, and gives rise to no inconvenience to the patient, though extremely dangerous: it often tends to spread very rapidly, but there is no cough or expectoration, only moist râles and dulness over the back, duskiness of the surface, and increased frequency in breathing, the breath being often offensive, and yielding crystals of ammonia. In favourable cases the lung begins to clear up about the time the patient begins to improve.

The patient is restless and sleepless, but dull, heavy, and stupid; and there is almost always delirium of a low muttering kind, worse at night, but sometimes of a fiercer kind. In severer forms there is twitching

of the muscles, and often waking loss of consciousness—*coma vigil.* The patient lies sunken down on his back, utterly prostrated, with finally picking at the bedclothes, and perhaps convulsions. There is almost always deafness to a greater or less extent, and the pupils are generally contracted, but may be dilated and sluggish. The urine is scanty and high-coloured, and there is often difficulty in passing it from loss of power in the bladder; hence the necessity of catheterization, even if the urine is dribbling away. The chlorides are diminished and the urea increased. Sometimes the urine is albuminous: it is in such cases that convulsions mostly occur. Pregnant women commonly miscarry, but this is not by any means necessarily fatal, as it might be said to be in scarlatina and small-pox.

Typhus fever usually lasts from twelve to twenty-one days, but in the great majority defervescence takes place on the thirteenth, fourteenth, or fifteenth day. Relapse is rare. Death commonly happens if at all in the second week. When the end of the fever has come the patient usually recovers very rapidly, and the change from utter prostration to convalescence is both marked and sudden. Often the patient is better after the fever than before. Consolidation of the lungs, however, may persist after convalescence has commenced, or erysipelas may appear. Sometimes we see venous or arterial thrombosis, with or without embolism. The most frequent secondary affection is inflammation of the parotid and submaxillary glands. Similar glandular swellings may occur elsewhere.

Nowadays, when the distinction of typhus from enteric fever is so thoroughly established, it seems hardly worth while to enter upon what used to be a kind of medical *pons asinorum*—the signs which distinguish the two. Briefly they may be said to rest on these—causation, mode of invasion, eruption, condition of bowels, complications, and duration.

The pathological appearances in typhus are few. The blood is peculiarly liquid, and the corpuscles crenated, or otherwise altered in shape. The muscles are soft, altered in colour, and partially degenerated. There is no enlargement or ulceration of Peyer's glands, though sometimes there is engorgement of the intestines. The spleen is large and soft. The liver is also larger and softer than normal, and the lungs more or less consolidated. The cerebral membranes are often injected, but any marks of true inflammation are rare. Most young people recover,

and the mortality is markedly increased with age. Fat, flabby people of intemperate habits make exceptionally bad subjects. Overwork after the illness has begun, or persisting too long in work, predisposes to a severe attack; hence the importance of going to bed directly the disease comes on.

Treatment.—Plenty of air and space is the first requisite both in preventing and treating typhus, and due means of ventilation to provide for the renewal of the air are equally necessary. Fever nests should promptly be emptied if we want the disease not to spread. Personal cleanliness too is of the utmost importance: except the patient be too much prostrated, a bath and clean linen should always begin the treatment. Next in importance is good nursing; and no man, if he is wise, will ever undertake fever cases without good nursing wherever it can be afforded. No amount of amateur nursing makes up for the skill of a trained nurse, and indeed often does more harm than good. The disease must run its course, but much may be done to conduct it to a favourable issue. Food and drink are the things most to be considered. At first the patient will take almost anything, but later food has to be given like medicine, and equal care should be used in giving directions as to it. Beef-tea, broth, milk, eggs, and wine are the chief things, milk being the most important; but others may be given, as raw pounded meat, essence (*not extract*) of beef, chicken-broth, white wine whey, blancmange, &c. Often the patient will take these things iced when he will absolutely refuse them hot. Sometimes we must give them by the nose or rectum. Food should be given frequently and in small quantities; not more, and as a rule not less, than two or three hours should be allowed to elapse without something being taken. Wine is of the very utmost value, and is most necessary in the second and third weeks; the best is dry champagne, but good dry sherry is that most readily attainable. Claret-and-water makes a pleasant drink to be taken ad libitum. Bad cases may require large quantities of spirit—brandy or whisky; as much as a pint a day may be given with advantage with lividity, tremulousness, low muttering delirium, a weak, quick pulse, and weak heart. But it is essential to understand that alcohol is not always necessary, that it is sometimes best dispensed with, and should be prescribed like medicine. For the thirst nitro-hydrochloric acid (♏ x ad ℥ j) in water may be given; for sleeplessness, opium (gr. ½) and chloral (grs. 15—20); if

there is much headache tartar emetic (gr. $\frac{1}{12}$) with opium (gr. $\frac{1}{3}$) does good. Shaving the head and the application of ice or other form of cold are also serviceable. Ice in other respects is invaluable, both internally and externally. Camphor (grs. 5-10) is highly praised by some where stimulation is required. If the lungs become congested, ammonia in good full doses (amm. carb. grs. v—x) must be given, and turpentine (℥ss—℥j) is of great use. For high temperatures—*i.e.*, over 104°, cold or tepid sponging or tepid baths are requisite. Where the glands swell, cotton-wool, and if necessary poulticing, suit best. In convalescence food difficult of digestion must not be given too early. Good bitter ale, and nitro-hydrochloric acid in chiretta, gentian or cascarilla seem to be of great service, though some prefer quinine and iron. Both mind and body remain weak for some time after the fever, and a change of air and scene is highly desirable; in no case should work be resumed too early.

RELAPSING FEVER.

This malady, to which also the name of Famine fever has been applied, rarely appears except in the epidemic form. It is infectious, but its powers of contagion are not great, except the individuals exposed to its influence have been exposed to privations, especially to cold, and bad or insufficient food. It accordingly appears most frequently in winter, and when destitution prevails.

The invasion of relapsing fever is particularly abrupt. Probably whilst walking about the patient suddenly complains of cold shivers, headache, and usually also of strongly marked pains, especially in the back and limbs. There is not, however, nearly so much prostration as in some other forms of fever. There is often also vomiting, especially of greenish matters, but diarrhœa is infrequent. One of the most marked features of the disease is the sweats, which occur early in it, and are sometimes alternated with rigors. The temperature by the third or fourth day is high, 102° or 104° F., or more, and the pulse is quick, usually 100 to 120. Frequently too there is yellowness of the skin, amounting, it may be, to jaundice, and there is tenderness over the liver and spleen, but the fæces are normal, though sometimes bile exists in the urine. On the fifth day all this is altered; a remission suddenly

occurs, and the patient feels almost well. The patient improves greatly during this period, but about the fourteenth day from the beginning of the fever there is a relapse and the patient seems as bad as ever. This, however, does not last long; in about three days there is again a remission, and this time, it may be, permanent improvement. There may be a second relapse, and this happens in a good many cases—usually about the twenty-first day of illness. More rarely there may be a third, fourth, or even fifth relapse. With all this, the mortality is not great, though alarming collapse may occur; and in most instances, except the patients have been previously exposed to great privations, they get well. Pregnant females always abort, and the child dies. Should death occur, the liver is found large and congested, and the spleen very large and soft.

As regards *Treatment*, the chief things are cleanliness, fresh air, good nursing, and plenty of appropriate food. Much cannot be done during the first five days, but we must look out for the first remission, and do what can be done for the patient during that period, especially in the way of food. It is useless to try to ward off the relapse by quinine or such like remedies; they have no influence in this way. The convalescence from this form of fever is unusually tedious, but this is in part due to the mode in which the fever is induced, the patient requiring a long time to recover from the effects of his previous privations.

THE PLAGUE.

The terrible illness known as the Plague fortunately now rarely occurs, though it is by no means certain that it may not be again revived. It appears to have been a malady allied to typhus, but characterized by swelling of the lymphatic glands in the groins, axillæ, and much more rarely in the popliteal spaces. Very often an epidemic of Plague has been preceded by famine, and the mortality from other diseases has then been unusually great. It usually makes its appearance first among the lower orders, inhabiting close, airless dwellings with filthy surroundings, and who are most likely first to feel the pressure of want. The time of year most favourable to its ravages seems the summer or autumn, and it has been noted of some epidemics that the weather which prevailed during their

height was unusually close and stagnant. Usually it breaks out in several isolated districts, and when circumstances favour its spread, rapidly invades the surrounding districts. This spread seems due partly to direct contact—contagion or infection, partly to what for want of a better name we must call "epidemic influence." It is usual for the disease, as happens in other epidemics, to be more deadly at first than later, and when the epidemic is at its height, it may prove fatal with extreme rapidity, so that people apparently well would drop down dead in the streets. Usually, however, the fever runs a distinct course, with premonitory headache, rigors, and depression of bodily and mental power. The fully developed fever is indicated by elevated temperature, thirst, black vomit, foul tongue and fœtid breath, quick and feeble pulse, with a tendency sometimes to syncope, again to furious delirium, and in other cases to stupor and coma. The urine is scanty, high-coloured, or bloody; sometimes suppressed. Discharges of altered blood may appear, and black wheals may form on the surface. There is usually a great tendency to the formation of carbuncles, and these frequently become gangrenous. Everything about the malady tends to show a profound alteration in the bodily tissues and fluids. The organs are usually softened and stained with the altered blood, and to this altered blood doubtless is due the extravasations already spoken of. The lymphatic glands are enlarged, softened, and discoloured.

As regards *Treatment* nothing is to be said. Fresh air, nourishing food, and stimulants in just proportion are plainly indicated, but the period of the epidemic seems to have the most material influences over the result in death or recovery.

CEREBRO-SPINAL FEVER.

This malady, also known as cerebro-spinal meningitis when it appears in an epidemic form, seems in a good many respects allied to typhus. The malady may come on gradually or suddenly, but in either case is ushered in by shivering, intolerable headache, and profuse vomiting. These initiatory symptoms are severe. There is also, as a rule, severe pain in the abdomen, and the muscles, especially of the back, soon become painful and contracted. There is often dizziness, and there soon comes on some degree of

mental confusion, sometimes amounting to delirium, sometimes passing into something like coma. One of the most marked features of the disease is retraction of the head and trunk, so that the body is arched backwards. There is increased sensibility of the skin, and the face is often spasmodically distorted. In almost all cases small purpuric spots appear on the skin, and in bad cases these tend to become inky blotches and patches. In such instances death rapidly ensues. There may also be some hæmorrhage from the mucous tracts, and in bad cases grumous vomiting. The bowels as a rule are confined, but in some epidemics they are more frequently relaxed. The urine is usually healthy.

In most cases the breathing is laboured and sighing. The pulse may not be greatly quickened, but is very weak and tends to dicrotism. The temperature is always over 100°, and may rise to 105° F. If the disease is to end fatally, it usually does so early, sometimes in a few hours; but the termination in convalescence is not very abruptly marked. The death rate is high.

After death it is usual to find congestion of the pia mater, very probably with greenish or yellowish purulent matter. This does not exist in the arachnoid cavity. Most parts of the cerebro-spinal system are gorged with blood. In the purpuric or petechial form the blood is markedly fluid. It is doubtful whether this disease is contagious—at all events it is not so in any marked degree.

The *treatment* of such a malady, of which so little is known, must needs be unsatisfactory. Very often in the height of the epidemic death ensues before anything can be done. In others, cupping (dry or wet) the back of the neck, seems, in some cases, to relieve the pain, but in most epidemics depletion is out of the question. Ice and ice-bags are, however, applications which promise better. They should be laid along the spine, and other parts of the body may be covered with flannel. In many cases subcutaneous injections of morphia do good, or opium in the form of extract may be given in full doses as early as possible in the disease. The food must be good, and carefully selected.

EPIDEMIC OR ASIATIC CHOLERA.

Cholera, to which the title of epidemic or Asiatic is prefixed, to distinguish it from the milder form of disease known as cholera morbus or British cholera, is a disease only known to us in epidemics; but in some places, especially in India, the disease has long been known as endemic. At first, in 1817, when it was recognised for the first time in recent history, it attacked only the natives, but soon Europeans suffered also, and the disease spread rapidly from the low-lying plains of Bengal east and west to China and Europe. In 1831 it revisited Europe, and the same year saw it extend all over the western part of the world, spreading death everywhere. In 1832 its ravages continued, and it was not till 1837 that it abandoned this portion of the globe.

As to the nature and causation of cholera little can be said: we know it only in its epidemic form, and in that it undoubtedly tends to spread by contagion, especially through the influence of the choleraic discharges, and an impure water supply. Upon the whole it seems to spread most rapidly in warm weather—with us in the hot autumn months; but it may also prevail during the colds of a Russian winter. On the other hand, attacks are most frequent early in the morning when the temperature of the individual is lowest. Moisture when associated with heat seems to favour its ravages, especially in India—but a heavy fall of rain, by clearing away impurities from the air and soil, may help to arrest it. As regards winds, sometimes cholera seems to spread most rapidly in their direction if they are long prevalent, but that is not always the case, especially if trade routes—for cholera seems mainly to spread by human intercourse—run in an opposite direction. Two agencies very powerful in spreading cholera are impure air, and impure water, especially when these impurities depend on animal refuse. Of course if the water be fouled with choleraic discharges the likelihood of thus spreading contagion is immeasurably enhanced, but the most impure water, as far as we know, will not alone produce cholera. The use of decaying articles of food strongly predisposes to cholera, and may of itself give rise to the malady known as British cholera. Fatigue too, and mental worry, are things to be avoided as much as possible in cholera times, being

powerful predisposing agents. The use of purgatives, especially those of a cathartic and hydragogue character, is strongly to be deprecated under like circumstances. A previous attack confers no immunity to the poison.

That there is a distinct cholera poison, and that it is contagious but in low degree, is indubitable, but in all probability it is mainly confined to the discharges. These discharges may infect directly through the hands of the attendants, through the soiled linen, or through the soil or water in which they are disposed of. If thrown on the soil, they may be washed off by water, or may dry, and so be capable of conveyance through the air. It is common to call such contagious particles germs, but the exact nature of them is not known. The cryptogamic theory of origin on the whole seems hardly tenable; but we have not yet arrived at a full understanding of the mode in which this mysterious disease is produced and propagated.

In different epidemics we have different varieties of cholera, from the slightest to the most severe. But in an average case we have first of all certain *premonitory signs*, or a *period of invasion*, of the greatest possible importance as regards treatment. Next follows the stage when *the disease is fully developed*, and in many epidemics this is the first observed. Thirdly comes an exceedingly well-marked stage, that of *collapse*, commonly called the *algide stage*, and finally, if it come at all, that of *reaction*.

In the first stage, before the malady is fully developed, there may be various signs of uneasiness, but the most important are those referrible to the stomach and bowels, which may be painful and disturbed. Often there is vomiting and purging, especially the latter. Now it is quite true that diarrhœa is almost invariably prevalent in cholera times, and many cases of diarrhœa might occur which would never pass on into cholera, but the rule is of the very utmost importance—viz., that no case of diarrhœa, however simple it may seem, should be neglected in cholera times.

When true cholera has become developed there is purging, the stools becoming watery and copious, and this looseness very often first appears early in the morning. There is nothing peculiar in the first stools beyond their watery character; they consist of the ordinary contents of the bowels, and being mixed with much fluid are exceedingly copious. The purging is repeated again and again, and

speedily a feeling of exhaustion comes on. The motions as a rule are painless, but sometimes are accompanied by griping. The colour soon passes from that of ordinary fæces to light straw or even paler, and this of course is more noticeable if the vessel has been changed; if the whole be collected together there may be enough fæcal matter to colour the whole, though imperfectly. Before long the evacuations assume the characteristic appearance of cholera—the so-called rice-water stools. They are thin, watery, slightly turbid, depositing a substance like broken boiled rice on standing. Sometimes the discharge is more milky in appearance. Vomiting sets in usually shortly after the purging; the matters vomited are considerable in amount, and clear and watery; but vomiting is less regular as a symptom than purging. The appearance of the rice-water stools generally ushers in another set of phenomena—viz., cramps of a very violent character; the lower extremities are most frequently affected, but the fingers and the abdomen may also suffer. By this time or earlier the face has become shrunken, and livid or leaden-hued, whilst the circulation becomes weaker and weaker, and the bodily temperature falls. Shrinking of the features is often a very early symptom, and though there be no purging to account for this, there will probably have been accumulations, of the peculiar rice-water material, in the alimentary canal.

Next comes the stage of complete collapse, in which the patient as nearly as possible resembles a corpse. The evacuations still continue, but are not so copious. The pulse at the wrist is imperceptible; the surface cold—even the breath is cold—the temperature often under 80. The hands and feet are blanched and shrivelled, the patient apathetic but capable of being roused. With all this there is urgent thirst, but the cold water desired very probably cannot be retained. The voice sinks to a hollow whisper, the breathing is oppressed, or paroxysms of dyspnœa occur. Most glandular secretions, with the exception of milk, are suppressed, for the blood is thick and tar-like. Frequently when the discharges have been retained for a time they are exceedingly offensive. This stage may last even forty-eight hours or more, and recovery take place, or the patient may die in three or four hours. In case of death the pulse never returns, breathing gets worse and worse, coma comes on, and the patient sinks. On the other hand, the abatement of

restlessness, quiet rest, and easy breathing are signs of improvement. The pulse comes back at the wrist; the shrunken appearance of the surface vanishes, as the veins and capillaries fill anew, and the temperature rises. Reaction has set in, but not necessarily has safety come. Though the retention of muscular strength in many cases, even during collapse, is remarkable, insomuch that the patient may fall down dead in walking from one bed to another, in most the strength gives way utterly, but with reaction it as speedily returns. Not so, however, in many cases the glandular secretions; and it now becomes one of the chief objects of the practitioner to bring these back again. The first sign of their return is usually an alteration in the colour of the evacuations, which gradually deepening in tint again approach the characters of normal fæces. More important, however, is the secretion of the kidneys, for no urine may appear for some hours; in some cases never, and the patient dies. The first urine passed is scanty, high-coloured, albuminous, and deficient in urea—probably also strong-smelling. When fairly established the secretion soon becomes abundant, and health may be considered restored. The longer the algide stage, the greater the risk of imperfect reaction. There may even be a relapse after reaction has set in, but this is not common. Cases of imperfect reaction are more common: the patient passes out of the algide stage, but does not improve in strength, and ultimately in many cases perishes. Uræmia is, unfortunately, too common, and many die of it. Vomiting from continued irritability of the stomach, and sleeplessness are also encountered, and delay convalescence.

It is important to understand that the choleraic discharge does not consist of blood plasma or even blood serum. It consists of a fluid containing little albumen, but a good deal of salts, especially chlorides and phosphates. The fluid portion has a specific gravity of 1012, or thereby. The solid portion, as seen in the fluid found in the intestines (*not in the discharges*) consists almost entirely of epithelial cells in various conditions of aggregation. The blood is thickened, and is occasionally acid.

The diagnosis of pronounced cholera is easy—not so the initiatory stages; but this is the less important, as in every case diarrhœa must, if possible, be checked. The early appearance of shrinking in the features and hands is very characteristic.

The post-mortem appearances in cholera are also

characteristic. First and most noticeable is the fact that, if the patient die in the stage of collapse, the temperature rises after death. The blood is chiefly found in the pulmonary artery and right side of the heart; the pulmonary capillary veins and left side of the heart are empty; the blood is dark in colour, but turns brighter on exposure to the air. It coagulates imperfectly. The peritoneum is congested, as are the mucous membranes of the stomach and intestines. The solitary and aggregate glands are enlarged, and granular patches may be observed on the surface of the intestine. The contents consist of the alkaline fluid already spoken of, with the shed epithelium. The spleen is small and flaccid, the kidneys congested. The character of the kidneys in those dying of uræmia resembles that of acute scarlatinal nephritis. If the lung symptoms have predominated, these will be found congested to a greater or less extent.

As this is not a place for controversy, it will be enough to say that a certain school of pathologists have founded their views, as to the causation of the disease, on the distribution of the blood. The system (say they) is poisoned; the small vessels of the lungs refuse to let the poisoned blood pass; the discharges are efforts of nature to get rid of this poison.

On the other hand, most think that the discharges are the essential portion of the disease, and to be arrested at all hazards.

Treatment. — Treatment in cholera, to be of any service, must be attempted early in the disease; when collapse has come on, we can only wait. The rational aim we have in view in treating cholera is to stop the discharges, not to foster them—on this most men are agreed. If the preliminary diarrhœa depend on some irritant substance in the bowels, that had better be got rid of; if so, a small dose of castor-oil and ℥x of laudanum will probably suffice. In most cases it is better to trust to astringents, especially to lead and opium in the form of pill (which should be freshly made). In India when the disease has fairly set in they generally give a full dose of opium (gr. 1-2), probably with 10 grs. of calomel, and when this is retained, no more medicine may be required. As the stomach is irritable, the medicine should be given in the form least likely to upset the patient, and so the less the better. The full effects of morphia hypo-

dermically have hardly yet been tried. The total quantity of opium given should be regulated by the approach of collapse; when that threatens, everything should be stopped. If the pulse flag in this stage, stimulants may be given: the best is champagne, next brandy and soda-water. They may be given pretty freely. For the cramps, friction is the best remedy.

When collapse comes on, we repeat we can only wait. The patient may be stuffed with remedies, but these are not absorbed until reaction sets in, and then they do harm. Even stimulants are better omitted, as likely to be hurtful later on; there is always danger in increasing the irritability of the stomach. The best thing is ice-cold water in small quantity frequently repeated, for it is possible to have too much of this even. Where collapse is not absolute, stimulants, such as aromatic spirit of ammonia, spirit of chloroform, and various essential oils, may help the patient to tide over the difficult period. But it is a well understood fact that patients do best when left alone. Sometimes, however, a warm or tepid bath seems to give relief.

When reaction begins, the only alteration in treatment should be the administration of a little food: iced soup or beef-tea is best, given in very small quantity, and allowed to melt in the mouth; the cold water to be continued. Purgatives are to be strictly avoided, lest they bring on a relapse. If there is tightness and uneasiness across the bowels, the best remedy is a warm-water enema. For the vomiting, if it continues after the secretions have been restored, a small pill containing a quarter of a grain of morphia with some sugar may be given. Previously, ice is the best remedy. Lime-water, milk, and champagne form a good combination to begin with, or milk, ice, and soda-water may be used instead. To get the kidneys to act, a warm bath, a mustard poultice to the back, and a dose of digitalis (inf. digitalis ℥ss) may be tried. In all stages disinfection should be strictly attended to.

Convalescence is slow. A change of air is highly desirable. Many plans of treatment have been proposed: but experience goes in favour of that given above.

YELLOW FEVER.

In many of its characteristics yellow fever seems to be intermediate between the infectious continued fevers, like typhus, and the tropical malarious remittents. It prevails almost exclusively in the West Indies, the neighbouring parts of North and South America, and the West Coast of Africa, but may be imported into other countries, particularly under favouring conditions of temperature.

The malady begins with chills, which are more marked in sub-tropical than in tropical regions. These alternate with flushes of heat, and presently the pyrexial symptoms become permanent. Towards morning there is generally some remission. There is much frontal headache, but the pain in the back and loins is very much more severe—sometimes excruciating. Early in the disorder nausea and pain in the stomach may occur; sometimes they are only seen later. The pulse varies: sometimes strong, quick, and hard; in other and more severe instances, it may be soft and weak. So, too, the condition of skin varies: in some it is hot and dry, in others cold and livid. The thirst is extreme, but as the disease advances everything is rejected as it reaches the stomach, and the pain and tenderness become more marked. At first the vomiting is accompanied by retching, but presently everything seems rejected without an effort. Early, too, the vomited matters become bilious, and are mixed with blood or serum, with chocolate-looking flakes, whilst the bowels are confined, and the stools clay-coloured. Presently the mind becomes disturbed, and the patient is inclined to wander; not unfrequently the brain symptoms resemble those of delirium tremens. This continues from a few hours to two or three days. The longer this stage lasts the better for the patient. Then the fever subsides: the pulse falls, the delirium departs, and the vomiting ceases, when bleeding at the nose, a profuse perspiration, or a copious bilious motion, may settle the question of recovery. But, on the other hand, the delirium may get worse, the stomach prove more and more irritable, the pulse grow weak, and the surface blanched. Finally cramps may supervene, and with a fresh discharge of black matter from the stomach (Black Vomit—vomito-prieto), bring death. In some cases the characteristic yellow

colour of the skin and conjunctivæ appears just before the subsidence of the fever; in others not till immediately before death. In some cases the mind is tolerably clear to the last; in others there is coma, or insensibility to all around.

The temperature in the malady has been known to rise to 107° F. The yellow hue of skin, which seems undoubtedly due to destruction of the red blood-corpuscles, is not invariably present, even in the same epidemic. The appearance of the tongue has been considered characteristic. It is covered with a white cottony fur, and is red at the tips and edges, but it may be discoloured by altered blood, which tends to transude from other parts besides the walls of the stomach. The urine is always scanty, and generally albuminous, it may be from the presence of blood in its altered constituents.

Treatment.—As to this little can be said. Quinine has no influence over this malady as it has over true malarial fevers. The only thing we can hope to do is to wait for the turn of the fever, and treat symptoms as they arise. The irritability of the stomach is always distressing. This may be met by champagne, ice, and spirits of chloroform, or chlorodyne.

GENERAL DISEASES.

(C).—ACUTE INFECTIOUS DISEASES, WITH SPECIFIC ERUPTIONS.

EXANTHEMATA.

Although in a certain sense some of the members of the group of acute infectious diseases already described might be characterized as eruptive, seeing that they are marked by a specific eruption, especially in the case of typhus, still the term *eruptive fever* is commonly associated with another group, of which small-pox might be taken as the type. These have all a well marked and characteristic eruption, and they commonly happen once in the individual's lifetime only—one attack freeing the individual from all subsequent risk in most cases, though not in all.

VARIOLA, OR SMALL-POX.

This malady, at one time one of the most fatal known, sometimes occurs epidemically, sometimes sporadically, but spreads only by contagion. The fatality of different epidemics varies much, insomuch that we seem to have been led to false conclusions with regard to it, and to the absolutely protective power of vaccination. Its poison is only developed in the pustules. Once developed, this poison may persist in an active state for years, ready under favourable conditions to develop the disease. The most characteristic feature of small-pox is its pustular eruption. Various forms of the malady are described and recognised—viz., the *discrete*, where each pustule is separated from its neighbour; *semi-confluent*, where these tend to run into one another; *confluent*, where individual pustules are no longer distinguishable; *corymbose*, where the disease appears in patches; *malignant* or *hæmorrhagic*, where there is a general tendency to hæmorrhages into the pustules, and from the mucous membranes—with other forms all presenting unusual characters, which may be described as *anomalous*.

After exposure to the small-pox poison there is a period

of incubation, lasting fourteen days, or twelve whole days and part of two others. This period is succeeded by rigors, and other signs of severe illness for forty-eight hours, after which the eruption begins to appear. The symptoms during this stage are great prostration, increased temperature (102°—104° F.), sickness and vomiting, with headache, and highly characteristic violent pains in the back. The sleep is bad, and sometimes, especially in children, convulsions occur, but they are rare in adults.

At the end of the forty-eight hours small shotty elevations may be detected on the hands and face, especially on the forehead and wrists. These are not tender, and they may be preceded by a roseolous mottled rash for a day or two, especially in modified small-pox. In favourable cases the patient is markedly better immediately the eruption begins to appear, and may fancy himself well if he has mistaken the meaning of the premonitory symptoms, as is not unfrequently done when small-pox is not epidemic. The eruption, however, gradually spreads to other parts of the body, only appearing on the legs and feet two days after its first appearance on the face and wrists. The eruption in the mouth, and on other mucous membranes, begins at the same time as the other, but is not usually noticed till later. The eruption is first papular, next vesicular, and finally pustular. The pustules break, and scabs form, which leave well marked scars behind. Roughly it may be said that the danger of the disease is in direct proportion to the amount of the eruption, the confluent form being the most dangerous. About the sixth day of the eruption, the pock alters: it becomes more pointed and more distinctly purulent, the inner divisions in it breaking down so as to form a single sac. Each pock is surrounded by an areola, swollen, dark-red in colour, and extending for some distance in every direction. Hence arises great pain and disfigurement, especially in the face, together with fever, commonly called *maturative fever*. By this time, too, the eruption in the mouth and nose has become troublesome, swallowing being difficult and breathing through the nose stopped. Various other complications may also arise. By-and-by the pustules break, and their contents escape, or drying form scabs or crusts, at first yellow, afterwards dry and brown. These are exceedingly itchy, but no longer painful. The crusts form on the face, and upper extremities, before they do on the lower limbs. In time the

scabs fall off, leaving marks at first red, afterwards white and depressed, and lasting a lifetime. During this stage the constitutional symptoms rapidly subside, and the patient may be practically well long before it is safe for him to appear abroad.

The initiatory fever is much more severe in the confluent, than in simple small-pox; in it there is usually very violent delirium, particularly in persons who have led irregular lives. Such patients usually die, but even confluent small-pox in previously healthy individuals is by no means necessarily fatal. There is a peculiar kind of small-pox, not often met with, where the eruption appears in clusters, whence it is called corymbose. This is a singularly fatal form of the malady, even though the pustules be comparatively scanty. The malignant variety of the disease, which used from the appearance of the eruption to be called the Black Pox, is a most formidable malady. The blood seems to alter, and to become fluid and watery. The eruption, if developed at all, appears slowly; there is bleeding at the nose, the urine is bloody, and fluid blood is extravasated into various parts, or discharged from the mucous surfaces. In this variety delirium is rare. The so-called petechial small-pox is characterized by small dark spots like flea-bites on the arms and groins, due to effused and altered blood. In still another variety the inflamed skin tends to become gangrenous, the pocks fill with a thin ichor, and the patient dies.

With the appearance of the eruption, save in bad cases, the symptoms markedly ameliorate, and this may go on till the period of secondary, suppurative, or maturative fever. In slight cases there may be no secondary fever, as it seems to depend on the inflammation of the skin, rather than any development of the malady. This stage ends in maturation of the pustules and discharge of their contents. It begins about the eighth or ninth day. There is during this period thirst, fever, and sometimes local inflammations in various parts of the body. Chief among these inflammatory affections are pleurisy, pneumonia, and bronchitis—all unusually fatal. There may also be inflammation of the tongue and discharge from the ear, but much more frequent is ulceration of the cornea, ending in complete destruction of it. This ulceration is not as a rule due to pustules forming in that situation, but to an inflammatory process ·ing on about the period of secondary fever.

Small-pox is often mistaken in its early stages, and this is the more important because it is at once wrong to expose others to the infection of small-pox, and to remove an individual unnecessarily to a small-pox hospital, where he must needs be exposed to infection. The malady most frequently mistaken for small-pox is measles, and yet the diagnosis should be easy. The eruption of small-pox appears after forty-eight hours' illness—that of measles only after seventy-two. In measles there is catarrh, redness about the eyes, and lachrymation. In small-pox there is none of these, but there is marked sickness and pain in the back. In measles the eruption may be slightly raised above the skin, but it wants the shotty feel of small-pox. There are other forms of disease with an eruption something like small-pox, as varicella, but in that there are only slight initiatory symptoms, and the eruption appears in twenty-four hours; there is no shotty feel, and the eruption is merely sub-cuticular.

As to the exact pathology of the disease little is to be said. The malady seems to be distinctly specific, and to originate invariably from infection, directly or indirectly. As regards the eruption, the pock is situated in the true skin, and the growing epidermis. When it becomes vesicular, it is distinctly multilocular, so that it does not collapse when pricked; usually too it is umbilicated or depressed in the centre, and here you may see a portion of white lymph, its white appearance being due to new cells growing from the so-called rete mucosum, surrounded by yellowish pus, up to a tolerably late period in the disease. Pocks do not form on serous membranes, but they, as well as parenchymatous organs, are liable to inflammatory changes during the malady.

Treatment.—The proper treatment of small-pox may be said to resolve itself into prevention or modification by vaccination. There is no cure for the malady—it must run its course. The first thing to be done when a case occurs is to put the patient in an open bed in an airy room; all curtains, carpets, &c. should be removed: they only serve to perpetuate the disorder. In the early stage some ice may be given to quiet the stomach, and a small dose of Dover's powder will help to relieve the pain in the back. A simple effervescing saline of citrate of potass with a little nitrate of potash in it, is the best internal remedy. When the eruption has made its appearance, we shall be able to judge somewhat of the severity of the case. If it promises to be bad, the hair had better be cut at once; and

in unvaccinated persons and young children, even this should not be waited for, as cutting the hair seems to relieve the headache, and better allows evaporating and other cooling lotions, or ice, to be applied to the scalp. The diet should be plain and light: tea, toast, bread-and-milk, and the like. The drink may be any simple fluid to which some feebly acidulous substance has been added, or plain cold water. For the sore throat, ice, borax and honey, or glycerine of tannin, may be used locally. The bowels should be well opened at the beginning of the disease, and subsequently a daily motion should be obtained by a little castor-oil or a seidlitz powder. Occasionally there is diarrhœa. For that. if at all excessive, chalk and opium, or dilute sulphuric acid and opium, may be given; or it may be necessary to give a little castor-oil and laudanum.

Early in the disease the patients are restless and do not sleep well. Here the fifth of a grain of morphia subcutaneously administered, or fifteen grains of chloral, often do good. Delirium is to be combated by stimulants. With the period of secondary fever the regimen must be altered and the diet improved: beef-tea and soup must be given, with a daily allowance of wine. With incipient convalescence quinine and iron must be prescribed. For the discharge from the pustules some powder like oxide of zinc is best. With ulcers and abscesses, the diet must be exceedingly good, and stimulant and tonic remedies given freely. Many plans have been tried to remedy the pitting —none succeed well. If any is to be tried, it is best to open each pustule on the face individually and early, and touch each with a stick of nitrate of silver. Cold-water compresses when the skin is tense help to relieve the pain.

VACCINATION AND MODIFIED SMALL-POX.

Small-pox may be modified in two ways—one by selecting our own time for introducing its poison into the system, another by first subjecting the system to the influence of cow-pox. The former practice, that of *inoculation*, has been generally abandoned, and is now illegal. It did good, but sometimes the disease tended to spread from the individual operated upon, and so became epidemic. Hence it has been completely superseded by Jenner's discovery of the protective influence of cow-pox when introduced into the human system, not to render small-pox impossible,

but to modify it most materially. This, however, only happens when vaccination has been duly performed. To this end it is necessary:—(1) That the vaccine lymph should be properly selected, about the seventh or eighth day, and before it has become at all turbid. (2) The person operated on should be in good health at the time of vaccination. (3) An arm-to-arm vaccination is best; the two should be brought together, and the vaccine vesicle opened carefully by numerous small punctures, taking care to draw no blood, and no turbid matter whatever. (4) The lymph should be thoroughly inserted into the arm of the individual to be vaccinated, yet in such a way that little or no blood is drawn, though the appearance of blood is a sure sign that the cutis has been reached. (5) It is advisable to vaccinate in three or four places, so as to bring the individual more completely under the protective influence.

In about two days a papule makes its appearance over each vaccinal spot, and this by the fifth or sixth day is vesicular, of a bluish-white colour, and depressed in the centre. By the eighth day—*i.e.*, the same day one week after vaccination, the vesicle is most perfect. Now a ring or areola forms around the base of the vesicle and continues to spread, so that the arm is swollen and painful, especially in the adult. Hence the patient is restless and uneasy, the bowels are disturbed, and the axillary glands may be enlarged. There is also severe fever: the temperature rises even as high as 104° F. By the tenth day the vesicle begins to fade, its fluid contents turn yellow and begin to solidify; by the fourteenth a scab has formed, which falls between the twentieth and twenty-fifth day, leaving a permanent and characteristic mark behind. In individuals no longer susceptible to the vaccine virus, when vaccination is tried, the changes vary indefinitely, sometimes approaching those described, at others giving rise to hardly any change. Often vaccination is accompanied or followed by some skin eruption, but any syphilitic rash does not appear until some time afterwards. That syphilis can be introduced by vaccination has been fairly proved; that such an event is in this country exceedingly rare, is also from the evidence adduced perfectly evident. Still, the possibility of such a thing ought to render vaccination direct from the heifer an available substitute as long as vaccination is by law

compulsory. The eczematous eruptions commonly seen to follow vaccination have nothing specific in their characters.

The result of vaccination is a modification of constitution, rendering the individual, if not absolutely impregnable to small-pox virus, at all events very much less subject to its influence, whether this is considered by way of liability to attack, or by way of virulence. A well vaccinated individual may often expose himself with impunity to the contagion of small-pox, and if he should be attacked, provided he is otherwise healthy, the attack is likely to be of slight intensity. Individuals with several vaccination scars are less subject to attack than those with one only. After a certain time too it is now generally allowed that re-vaccination is advisable, especially in the face of a threatened small-pox epidemic. Re-vaccination in the adult may be followed by more severe symptoms than in the infant, especially when the vaccine lymph is impure or long preserved.

Small-pox in a well vaccinated individual is usually very slight: the premonitory symptoms may be tolerably severe, but the eruption may consist of not more than one or two pustules, and the patient is practically well as soon as these begin to appear. In almost all secondary fever is rare or slight; in others again, especially when vaccination has been imperfectly performed, the disease may run a course similar to that seen in unvaccinated individuals. The importance of *proper* vaccination is thus, if possible, greater than of vaccination itself, as imperfect vaccination may tend to a confidence altogether unwarranted and unwarrantable.

VARICELLA, OR CHICKEN-POX.

This too is an infectious disease, accompanied by an eruption vesicular in character, rarely approaching the pustular form, lasting only a short time, and not recurring in the same individual. The malady is propagated, as far as we know, by contagion only. It is essentially a disease of childhood, and is not protective against small-pox. The symptoms before the eruption are slight or imperceptible. The eruption itself is commonly first noticed as consisting of limpid vesicles, but a red spot may be detected earlier. The patient looks much as if

splashed with scalding water. The vesicles are nearly transparent, rounded, and contain a clear fluid: their structure is that of a simple vesicle without compartments, so that when pricked they collapse completely. Each night, for four or five nights, there is an outbreak of fresh spots, which speedily become vesicles. This eruption occupies all parts of the body, and is often very itchy, so that children can hardly be restrained from breaking the vesicles by scratching. This is the more important, as the scabs which form as the vesicles die away are not nearly so thick and adherent, as those produced after breaking. Left alone the vesicles become whey coloured, but never purulent, and soon form thin crusts which fall off, leaving no mark, the cutis vera never having been implicated.

The symptoms during the eruption are slight. There may be some evening fever, but usually this is slight except there be also some catarrh of the air-passages, which is not uncommon; but often the children are left in a delicate state of health which requires good food, change of air, and a little quinine. The whole malady is over in a week or so.

It is important that this malady should not be confounded with modified small-pox. They differ in premonitory symptoms, which are usually severe in small-pox, absent in chicken-pox; in the characters of the eruption, and in its coming out in successive crops in chicken-pox; in the duration of the disease; and finally in the important fact that the one has no influence in preventing the occurrence of the other.

MORBILLI—MEASLES.

This eruptive malady, also known as *rubeola*, is only propagated by contagion; is usually epidemic in character, and most frequently attacks children. The contagious principle tends to propagate itself like a ferment, hence the disease is classed among those termed *Zymotic*. It seldom occurs more than once in a lifetime. Often it is associated with epidemic hooping-cough, though the two maladies have nothing to do with each other. The contagion of measles may be carried for miles by clothing or other articles containing it. Ordinarily two forms are recognised—*simple measles*, and *black* or *malignant measles*. The latter is now rare. This form of the malady was

characterized by a similar blood change to that in malignant small-pox, as indicated by the dark appearance of the eruption, petechial spots on the body, bloody urine, and extravasations in various parts. In this form there was great prostration from the first, together with low-muttering delirium, or partial coma.

In ordinary simple cases of measles, after exposure to the contagion, there is an incubation period of ten days or a little more, after which the malady comes on abruptly, occasionally insidiously. After a chill or rigor, there is running from the eyes and nose, with intolerance of light, and fretfulness, and peevishness, especially if the child is disturbed. There is heaviness over the forehead, and the eyes feel as if there was sand under the eyelids; then there is sneezing, and the fluid which runs from the nose is thin and rather acrid. The throat is mottled with redness and sore, but not much swollen. There is dry, hacking cough, oppression at the chest, with wheezing sounds over the air-passages. The voice is hoarse, and the tongue is coated with a moist fur, whilst the lips are parched, and the skin hot and dry. Appetite is lost, and there may be slight nocturnal delirium. Vomiting early in the disease, usually indicates a rather severe attack, especially if persistent. The bowels vary, but diarrhœa may occur about the period of eruption, and the abdomen may be painful and tense.

On the fourth day—*i.e.*, seventy-two hours after the beginning of the above symptoms, a peculiar eruption appears on the forehead, close to the hair, and on the chin, whence it spreads to other parts of the face and trunk, and afterwards to the extremities. Small roundish red spots are seen; they increase in number and become elevated, but not markedly so. The spots are usually in crescentic or irregular patches. At first they are quite isolated, but latterly they coalesce and form large patches, so that the surface may seem nearly uniformly red. At the same time the fever and lachrymation become more marked (temp. about 103° F.), and the rash causes some swelling of the surface, affecting chiefly the features and the hands and feet. Slight deafness is often observed. The rash is always most abundant on the face and upper part of the body, and it may only be observed on the lower limbs a couple of days after its first appearance there. Each spot runs a short and definite course; in twenty-four hours it is usually no longer visible, only a mottling

being left behind. The colour of these spots varies: at first of a light red, they later on become duller, or of a coppery hue. The eruption disappears in the order in which it came. With the eruption the cough often tends to become paroxysmal, and the râles in the lungs more decided, but on the second or third day of the eruption the fever disappears, the pulse falls, and convalescence begins.

About the sixth day after the appearance of the eruption, the cuticle where the rash prevailed begins to come away in fine scales or dust, especially where exposed. As a rule, the malady is over in about fourteen days.

The glands in the neck and groins often enlarge, but do not suppurate, subsiding about the seventh day; but this and other symptoms tend to vary with the constitutional condition of the patient. The most common complications are pulmonary, and may be masked so as to be difficult of diagnosis. They are more frequent in winter than in summer, and include various forms of inflammation of the pulmonary substance, and bronchial tubes, with a tendency to pulmonary collapse. It is especially to these complications that attention should be directed, as they not unfrequently prove fatal. The convulsions, which in young children often occur early in the disease, rarely prove fatal, except they occur also in the later period of the disease.

The diagnosis of measles chiefly rests on the period, order of development, and character of the rash, and the accompanying catarrh and coryza. Before the rash appears a diagnosis is hardly possible, except the malady be at the time epidemic. In scarlet fever the rash appears on the second day, and is more universally diffused than in measles, and the hue is brighter; moreover, the patches of eruption in measles are different from those in scarlet fever, being much better defined. In small-pox the eruption appears on the face during the third day (after forty-eight hours) with violent sickness, pains in the back and loins, and the rash from the beginning is hard and shotty; with this eruption the fever falls, but with the eruption of measles it is rather aggravated. Syphilitic roseola is not unlike measles, but the history affords a sufficient clue to guide to a proper discrimination.

Treatment.—This is in most respects similar to that adopted for other diseases of the same class. Good ventilation in a fairly warm room (temp. 60—65° F.), light and nutritious food, and quiet are essential. The great

thing is to prevent draughts reaching the patient, for fear of lung complications. The heat of the body should be allayed by tepid sponging, and acidulated drinks. The necessity for stimulants must be judged of in each particular case, as well as by the nature of the epidemic. If vomiting is troublesome, only very small quantities of anything should be given at a time, but ice may be freely ordered. For the ordinary catarrh Vin. ipecacuanhæ in ℥iij—x doses, with a little nitrous ether, is the best remedy. In inflammation of the throat and air-passages more marked in degree, the inhalation of steam usually does good. In other cases, where the fauces are chiefly concerned, sucking ice does more good. In yet other cases a sponge wrung out of warm water, and sprinkled with a little turpentine, will be the best local application to the throat. At the same time stimulants internally must not be overlooked. If the rash threaten to go back, as it is called, a hot bath with a little mustard, and some friction to the skin will be the best remedy.

As the child improves in health (and the process is often a slow one), warm clothing and much rest are essential. Early hours are most important. Sea-bathing, or the cold sponge-bath should be used judiciously, and iron and quinine with cod-liver oil be prescribed. A good form of iron is the syrup of the phosphates. Such treatment and management will ordinarily remove any sequelæ, to which otherwise the ordinary rules of medicine apply.

SCARLATINA, OR SCARLET FEVER.

This acute specific disease also belongs to the infectious group. It is most frequently epidemic about the end of summer, and is characterized by a peculiar eruption. It only occurs once in a lifetime, and attacks the young more readily than the old. After exposure to the poison the malady may make its appearance in a short time, say twenty-four hours, or it may be delayed for three weeks. When the disease is fully developed, it may be so slight as to hardly discompose the patient; or it may be so severe as to kill in a few hours, and both forms may be seen in the same epidemic and in the same family. Two forms are generally recognised—*ordinary* or *simple scarlatina*, and the *malignant* form of the malady. In the ordinary form the symptoms generally come on abruptly, beginning with sore throat. Tenderness at the angle

of the jaw, and stiff neck, are highly characteristic indications of its onset, if taken with the rise of temperature. In children, however, vomiting is usually the first symptom. It may be repeated, and yet not have the evil omen of vomiting in measles. The first sign of the fever is a sensation of chilliness, perhaps amounting to a rigor, with headache and pains in the limbs. Next follow flushing of the face and a rise of temperature to over 104° or 105° F. the first day, and the pulse may be as quick as 160. The respirations are quickened, but there is no cough or watering at the eyes. The tongue is moist and furred, with red tip and edges, or clean throughout, as is the rule later in the disease. The patient is sleepy during the day, restless and sometimes slightly delirious at night. There is also frontal headache, and convulsions may occur.

In from twelve to thirty (average twenty-four) hours from the onset of the symptoms, a rash makes its appearance, usually appearing first on the sides of the neck, and upper part of the chest—not on the face, as in measles—but soon covering the body. The rash consists of small bright red dots, deepest in colour in the centre, but confluent all round, so as to leave no normal skin apparent. There is no elevation of the cuticle, and the spots disappear for the time under pressure, only to again appear. In other cases the colour may vary: it may be dusky, or it may be lighter than the usual tint. If the spots are discrete, they may be found elevated, and sometimes small vesicles form. This rash reaches its maximum on the third or fourth day of illness, and passes away altogether in from five to ten days. In bad cases there are petechiæ. There is always some degree of sore throat, the parts affected being the arch of the soft palate, together with the posterior wall of the pharynx. These are red and greatly swollen, so that the two tonsils may nearly meet in the middle line, and the uvula seems clubbed and œdematous. At first the parts are dry, but later there is excessive secretion of a highly tenacious character, forming something like a false membrane. In some cases there are true false membranes, ending in the formation of sloughs. By about the sixth day there may be an abscess in the tonsils, and it may be ulceration of them also, but this commonly comes later. The glands at the angle of the jaw are inflamed and tender. From all of these causes there is difficulty of swallowing; sometimes also of respiration, with snoring, and alteration in the tone of

voice. In ordinary cases the sore throat goes with the eruption, and disappears about the seventh day, leaving, however, some stiffness about the jaws. After the seventh day the pulse and temperature fall, the latter it may be to somewhat below the normal line. As the rash disappears the skin becomes dry and wrinkled, and in a few days the cuticle begins to scale off. The parts first attacked by the rash are the first to desquamate, and there the cuticle is thrown off as a fine scurf. Where it is thicker, larger and larger pieces are thrown off, until sometimes the whole cuticle of the palms and soles is thrown off in single pieces. In favourable cases the whole is over by the third or fourth week.

True malignant scarlet fever presents a very different history, and if it occurs first in the epidemic, there may be some doubt as to its nature, for the patient often dies before the eruption has time to come out. The patient becomes suddenly faint and vomits, his strength is suddenly and completely prostrated. The surface is cold, but the internal temperature high. The pulse is very quick and feeble. There may be no attempt at reaction: the skin is cold and mottled, covered with cold sweats. There is coma with convulsions, and in a short space death ensues. We have known such a case as this to be the first in an outbreak, and to be followed by others in all degrees of severity.

In another form, also spoken of, but erroneously, as malignant, the nervous symptoms are the most marked. The early stage is somewhat marked, the rash is abundant, there is considerable sore throat and pyrexia, but there is from the beginning a tendency to delirium and sleeplessness, with great agitation and excitement. There is much vomiting, so that food cannot be retained; the pulse is full but weak and quick. By-and-by the delirium gives way to stupor with delirious intervals; there is great depression of strength, and the patient may sink quite suddenly. Such a history is familiar enough to those who have been accustomed to treat acute febrile disorders in dissipated persons, and hardly deserves the title malignant, even though it occurs in such as have not been accustomed to such dissipation.

The departure of the rash is not, as in most other eruptive maladies, a sign of speedy convalescence in scarlet fever, other risks have frequently to be encountered. Chief among them is the renal dropsy called,

from its connexion with this disease, scarlatinal dropsy. The occurrence of this sequela is in no way regulated by the severity of the scarlatina, but seems to depend rather on the epidemic, being much more frequent in some than others. Very frequently the history is as follows. During desquamation of the cuticle the child has been exposed to cold. This is promptly followed by great diminution or total suppression of urine. What is passed is dark or bloody, and contains albumen, with bloody and other casts, in great abundance. There is marked dropsical swelling in all parts of the body, but especially in the face and scrotum. This swelling may be very great, or it may be slight. Often there is dropsy of the serous cavities; sometimes of the pleura, where it speedily causes death. In all these cases of renal dropsy there is marked anæmia or hydræmia. Under treatment this condition may depart and perfect recovery follow, but too frequently the kidneys remain permanently damaged, and the malady resists all treatment. In such cases there may be altered flow of urine, and permanent albuminuria. (*See* CHRONIC BRIGHT'S DISEASE.)

Another troublesome sequela of scarlet fever is otorrhœa, often associated with coryza. The inflammation of the throat and nares extends along the Eustachian tube. Complete disorganization of the inner ear, with destruction of the membrana tympani, and fœtid discharge follow. Even more dangerous consequences may ensue. The sore throat of scarlet fever may persist, or another form may arise about the end of the first week. In this last, ulceration may spread extensively, the tonsils be destroyed, and even some of the adjacent parts. Sometimes retro-pharyngeal abscess may be formed by extension of this inflammatory condition, and may prove fatal in various ways. So too of the brawny swelling of the neck, caused by extension of the inflammation to the tissues in the neck itself. Bronchitis and pneumonia may be set up by a similar extension; whilst of another complication, scarlatinal rheumatism, like gonorrhœal rheumatism, little is known.

The diagnosis of scarlet fever from measles, small-pox, and the so-called rötheln, is not always easy. The chief difficulties would arise if the scarlatinal eruption was unusually dark and scanty; but as regards measles, the absence of coryza would help. Again, the roseola which precedes small-pox might confuse one. Here we would have

the pain in the back, and the fully developed eruption would soon settle the difficulty. The so-called rötheln may in reality be a form of scarlet fever or of measles.

Treatment.—At one time, belladonna was vaunted as a preservative from scarlet fever, but nowadays it is seldom if ever used by regular practitioners. The general diet and regimen of scarlatina are the same as in other fevers of the kind. Judgment must be used when to enrich the diet and give stimulants: this can only come of experience. For the sore throat in its early stage either ice may be given freely, or if the child is older, swabbing out with nitrate of silver may be tried: steam inhalation, and hot water fomentations or hot poultices may also be used. The application of nitrate of silver solution, or of sulphurous acid in the form of spray, both by the mouth and the nose, is of the greatest service. The nostrils should be well washed out by running the water from one nostril to the other. The water should be coloured, so as to be still transparent, with permanganate of potass. Otorrhœa should be dealt with in the same way. Whenever abscesses form, they should be at once opened, and good food, stimulants, and iron given.

In all cases of scarlet fever patients should be kept in bed for three weeks, with their room at a temperature of 60° F., until desquamation has completely taken place. If dropsy appears hot baths—water or air—are to be used, and compound powder of jalap in 20-grain doses given, and these powders may be repeated three times a day. Some hot vegetable infusion, which is commonly called herb-tea, and some Dover's powder (not more than a grain or two, according to the age of the child), together with some James's powder, may also be given to get rid of the dropsical swelling by perspiration. Much care is required in the after-treatment, and a change to a warm but not relaxing climate is of great service.

ERYSIPELAS.

Erysipelas is an acute specific disease, commonly the result of blood-poisoning, and sometimes spreading, especially in hospitals, with great rapidity. It is characterized by fever, foul tongue, disordered bowels, and a peculiar inflammation of the true skin and lymphatics, together with a marked serous transudation into the skin

and subcutaneous tissues. This inflammation tends to spread from one part to another. Sometimes the malady seems epidemic, and in some parts it seems to be endemic, though commonly the result of some direct irritation of the skin, or exposure to cold and the like. In the surgical wards of hospitals, especially if overcrowded, erysipelas, if it once breaks out, is extremely likely to spread by direct contagion. One attack seems rather to predispose to another, than to exert any protective influence. It commonly begins with some degree of chill or shivering, with nausea, and pain in the limbs, headache, and depression. These symptoms ordinarily precede the local manifestations of the disease by some time. When these appear the fever does not abate, but rather gets worse. The part most frequently attacked in cases coming under the notice of the physician, is the head and face. In surgical cases the site will of course be influenced by the existence of a wound or injury. The nose and ear seem to be the favourite spots for the commencement of the malady. These are seen to be tense and shining, are hot, irritable, and painful, and exceedingly tender. The surface is elevated, and the difference between the affected and non-affected portions of skin as the disease creeps onwards is very striking; this, however, is not so marked in the parts where the inflammation is dying away. The degree of swelling varies: generally it is enormous and gives rise to great disfigurement for the time being. The swelling is greatest where the tissues are laxest, and where the subcutaneous connective tissue can be swollen with fluid. On the other hand, the pain is greatest where a tense fascia like the scalp is the part affected. Under such circumstances there is usually suppuration, and it may be gangrene of that tissue. In slight cases the surface may be little affected, the epidermis scaling off as the disease departs, but in others there may be formed extensive blisters or bullæ, which on bursting form crusts. The malady can often be seen in all stages in the same individual, especially if it tends to be *ambulatory*. In facial erysipelas the mouth is almost always affected with catarrh; hence the foul tongue, and ill-smelling breath. When erysipelas arises from a poisoned wound, the lymphatics become inflamed to a marked degree, even before the local dermatitis appears, and the glands may suppurate. The pulse in erysipelas is full and quick, over 100 or 120, and the temperature high—102–104° F. If the temperature has

fallen and again rises, a relapse, which is common in the disease, is betokened. The urine is sometimes albuminous, and sometimes from the very beginning the symptoms indicate malignancy. The inflammation of the skin may extend to any degree, from slight erythema to gangrene. Gangrene is especially apt to supervene on that form of erysipelas, which commonly affects dropsical limbs, if injured in any way. The extension of erysipelas to the throat, or to the brain, is full of danger.

Treatment.—This must be regulated entirely by the degree of the malady, and the condition of the patient. In some cases nothing does so much good as Epsom salts in full doses; in others these would speedily kill the patient, who, if there be much depression, requires good food, wine, and bark and ammonia. The remedy most relied on is the perchloride of iron in full doses—30 or 40 minims of the tincture or liquor every four hours. Locally, pencilling with nitrate of silver often does good; but on the whole, and in moderate cases, the best practice is to dust the parts with a little powder, as of oxide of zinc, and keep them well wrapped up in cotton-wool. But if there is great pain and tension, as in the head, the direct application of cold by means of cold compresses or ice undoubtedly gives relief. When pus forms, it should be promptly evacuated; but here erysipelas passes from the domain of the physician to that of the surgeon. Such cases require careful nursing, and the risk of the pus burrowing must constantly be borne in mind, so that the sooner any collection of pus is opened the better. Here too, supporting treatment, and the use of stimulants are highly necessary.

GENERAL DISEASES.

(D).—ACUTE INFECTIOUS, OR EPIDEMIC DISEASES, MAINLY AFFECTING THE AIR-PASSAGES.

DIPHTHERIA.

If there be any doubt as to the epidemic and specific character of croup, there can be none as regards diphtheria, which in many respects is closely allied to the former, insomuch that the two can sometimes be hardly distinguished. Diphtheria derives its name from the false membranes which tend to form in it, not only on the tonsils, pharynx, and air-passages, but on any exposed surface of the body, as a raw blister.

Diphtheria is most frequently an epidemic malady, but in some parts, especially the north-east coast of Scotland, where croup was wont to prevail, it has now become endemic. It is eminently contagious, the contagious property resting in the sloughs or false membranes alluded to. Diphtheria may come on gradually or suddenly, but is generally preceded by a period of malaise, lassitude, and debility, with a chilly feeling hardly amounting to a rigor. Soon a sense of stiffness about the neck is established, with enlargement of the glands behind the jaw, and before long the throat may be seen to be dry, dusky, and red. But this redness is soon relieved by greyish or ash-coloured specks, which speedily spread and coalesce so as to cover the whole of the tonsils and soft palate, extending forwards to the cheeks, backwards into the pharynx, upwards to the nares, and downwards by the larynx to the bronchi. Sometimes enlargement of the glands near the bifurcation of the carotid is noticed before this. The false membrane is firmly attached to the tissues beneath, and if it is forcibly removed, is speedily renewed. Swallowing is difficult and painful, at first from mere

swelling of the parts, later on from paralysis. The false membrane looks very much like wash-leather, and may form on other mucous membranes than that of the throat, such as the conjunctiva, the vagina, and even the rectum. It consists of epithelium more or less altered, leucocytes, and red blood corpuscles, bound together by fibrinous material, and involving the whole thickness of the mucous membrane. This rapidly passes into a putrescent condition, which renders the patient's breath hardly bearable. Sooner or later, however, the membrane is thrown off, and coughed up, sometimes in pieces, sometimes in great moulds or casts of the parts attacked, leaving behind a raw, and sometimes almost gangrenous surface devoid of mucous membrane, and laying bare the subjacent tissues. In other cases the surface tends to become healthy, with much less loss of substance. But with the casting off of this false membrane danger is not at an end, as is the rule in croup. The prostration may be so extreme that the patient dies of sheer weakness, the intellect remaining clear. In diphtheria the patient may die in the first instance from the violence of the disease, much as in malignant scarlet fever, or the worst forms of typhus; and this is the most frequent mode of death in the earlier parts of an epidemic. Later he may die, as in croup, asphyxiated by the false membrane. Or, again, he may die, later still, quite conscious to the last, of sheer weakness, of uræmia, or some other complication. The general symptoms vary much in intensity; usually there is marked prostration from the first, but there may be little or no pain, beyond that spoken of as produced by motion of the parts. The pulse is quick, but not hard, and soon gives evidence of debility. From the difficulty in swallowing the saliva dribbles from the mouth, and substances swallowed are returned by the nose. If the nose be affected, after a time an acrid fœtid fluid flows from it. There may be bleeding from various parts, especially the fauces, and early in the disease albuminuria is of frequent occurrence.

In favourable cases the mouth and throat gradually clear, but remain painful. The power of taking nourishment is now of the utmost importance, and it must be given with no stinted hand. But convalescence is always slow—there is great feebleness and marked anæmia. Moreover, it is common to have all kinds of paralysis as regards site; there is paralysis of the soft palate

and muscles of the pharynx; and there is paralysis of the muscles of the cheeks. From these the patient frequently can speak only imperfectly, can swallow, fluids especially, with difficulty, and cannot bring his lips together to whistle. The muscles of the neck and back are often paralysed, so that the upright posture is hardly possible. Often too the arms are paralysed, still more frequently the legs, so that they drag in walking, or walking is impossible. Frequently accommodation of the eye as to distance is destroyed by paralysis of the ciliary muscle, so that vision is interfered with. A slightly convex glass, however, overcomes this difficulty. A more serious condition is extreme slowness of the pulse, from interference with the innervation of the heart. All of these forms of paralysis, however, tend with due care to get well of their own accord, and many triumphs of medical skill are recorded where only this tendency was really at work. There is often seen exaggerated sensibility, as well as impaired motility, in these cases. The occurrence of these nervous symptoms has no reference to the severity of the local symptoms, and they generally show themselves after convalescence has fairly begun. Neither can we tell with certainty whether they are central or peripheral, though the balance is in favour of the latter view. In ordinarily favourable cases convalescence begins about a fortnight after the onset of the malady.

Treatment.—In all cases of true diphtheria care must be taken to prevent any spread of the malady from contact with particles of false membrane thrown off. More than one promising surgeon and physician have been thus cut off. As in diphtheria the source of danger is twofold, so our attention ought to be directed at once to the local condition, and to the general state. The spread of the false membrane must if possible be checked, and the bodily strength supported. The usual rules as to the sick room in acute infectious disease are to be observed, and it is often advisable to see that the house drainage is perfect. Disinfectants too should be used. To the outside of the throat hot fomentations should be applied. To the inside sulphurous acid, or a hot solution of borax should be applied in the form of spray, and warm water inhalations made use of. If the membrane threatens to form on any spot these same remedies, together with the strong liquor ferri perchloridi, may be applied by a swab made of cotton-wool attached to a penholder. Later on, when

the sloughs are loosening, liquor potassæ permanganatis should be used in like fashion. Sucking chlorate of potash crystals often gives great relief. Ice, too, is invaluable used in the same way.

Internally the great thing is food and drink—strong soups and beef-tea, port wine, and if necessary brandy. Bark and ammonia (amm. carb. gr. vj—x, decoct. cinchonæ ℥j—pro dosi 4tis horis), and liq. ferri perchloridi ℥ss or more, also every four hours, are good remedies. Ice and champagne are invaluable if they can be got. The patient must be kept at absolute rest, so as not to exhaust the little strength he has. As in croup, steam should be freely generated in the apartment, and its temperature kept high (60°—65° F.). If suppression of urine threaten, a large poultice should be put on the back, and warmth applied to the feet. If there are signs of impending suffocation an emetic of sulphate of zinc (gr. xv) and ipecacuan. (gr. x) will often relieve it by getting rid of the false membrane; or tracheotomy may be had recourse to. Where there is marked weakness of the heart, drachm doses of ether will often relieve. If swallowing fail nutrient enemata or the stomach pump (if the parts be not raw) must be tried.

In convalescence nothing does so much good as change of air, and absolute quiet in the open air, especially at a warm seaside spot. Quinine, iron, and strychnine are the chief remedies. Electricity, in the form of the continuous or interrupted currents, may be used for the paralysis, the former also for any neuralgia.

CROUP.

Croup, also called *cynanche trachealis*, may or may not be an epidemic and infectious disorder—at all events it is so closely allied to diphtheria, which undoubtedly is both, that the two are better discussed in the same connexion. Croup is essentially a malady of early life, usually occurring in children under five years of age, or at all events before the second dentition. Unlike most of the maladies discussed in this connexion, a first attack rather predisposes to a second, a strong argument against its specific character as an epidemic infectious disease. Croup essentially consists of an inflammation of the windpipe, especially of its upper part, including the larynx, but rarely affecting the tonsils or pharynx. This inflammation results in the formation of false membranes in the air-

passages, these being composed of an exudation involving the epithelium of the mucous membrane, but not the membrane itself, and so capable of removal without injuring its surface further than partially denuding it of epithelium.

The history of a case of croup is very often as follows. A child, after exposure to a cold wind, such as the north-east, is brought home, and at first seems fairly well. In the evening he may be a little feverish and irritable, but presenting no very unusual indication when put to bed. After being an hour or two in bed, he wakes up with a hoarse, brassy, barking cough and hoarse voice, together with a sense of impending suffocation. He sits up in bed, and grasps at his larynx, agitated and fearful. The face is flushed, the eyes sparkle, but presently become more or less suffused and congested, whilst the difficulty of breathing continues and increases. The restlessness is extreme and breathing most laborious, producing a peculiar wheezing sound. There is great thirst, and the pulse is hard and quick. No covering can be kept on the child: the arms and legs are constantly thrown about, whilst the breathing becomes more and more difficult, and the cough more violent. The head is held back so as to straighten the throat to the uttermost; the nostrils work, and the epigastrium is drawn inwards at each inspiration. This cough is followed in the early stage by no expectoration, and gives no relief, but rather adds to the general congestion, and difficulty of breathing. Speech is interfered with so that the child can only whisper, and that with pain and difficulty. Swallowing too may give pain. As the malady advances the difficulty of breathing increases, and the cough, if apparently less violent, is so because more difficult. At the same time the surface becomes livid, and covered with a cold sweat. The child is drowsy, but wakes up in terror if it fall asleep. The skin is cold and clammy, the nostrils dilated, the respiration hurried, and the pulse quick and feeble, or intermitting. Death may follow in about eighteen hours from the beginning of the attack, either by suffocation or by coma. This of course is the history of an exceedingly acute attack. In others there are signs of sore throat, or of bronchitis before the croupy symptoms come on, and in such cases the malady may extend over several days.

Death is perhaps most frequent on the fourth day. In

such cases there may be well marked, and most delusive morning remissions. When recovery takes place it usually comes on slowly, with improved breathing and free expectoration; more rarely by violent vomiting and expulsion of the false membrane. The false membrane which is thrown out in croup consists of the normal epithelial cells, of colourless corpuscles produced therefrom, and fibrinous material. The larynx is most extensively affected, but the false membrane may extend downwards into the bronchi; as there is always risk of a fatal bronchitis or broncho-pneumonia, this greatly aggravates the risk of any attempt at operation. In other cases it extends upwards to the soft palate, but these cases must be carefully distinguished from diphtheria. In croup there is never the same general prostration, albuminuria, or risk of paralysis, which are the rule in diphtheria. Not unfrequently the disease follows on measles, and then a low type of malady may be looked for.

The diagnosis of croup rests chiefly upon the hoarse, brassy, ringing cough, the loss or hoarseness of voice, the early implication of the larynx giving rise to crowing inspiration, and the general signs of fever. The only maladies with which it can be confounded are diphtheria and laryngismus stridulus, and the diagnosis is not always easy. Laryngitis rarely occurs in children, except as the result of inhaling some irritant substance, whilst in spasm of the glottis there are no signs of fever. The mortality from croup is great; most cases terminate fatally, especially if only treated after the disease has fairly had time to seat itself. The malady is most common in cold, damp climates, especially in early spring, during the prevalence of north-east winds.

Treatment.—In no disease is early and prompt treatment more necessary, and as it not unfrequently runs in families, so it becomes the more necessary to understand what steps to take. Such children should never be exposed to these cold winds, and the parts should, as far as possible and is judicious, be braced up by daily bathing in cold water, followed by sharp rubbing with a towel not too coarse. If a child, of two or three years, comes home after such exposure as we have spoken of, or begins to cough with the peculiar cough alluded to, or even shows signs of hoarseness, it should promptly be placed in a hot bath. If possible, it should be covered with the hot water up to the neck; if that

is not possible, the legs should be placed in the hot water and the whole body laved with it. Next the child should be wrapped in warm blankets, without drying, and placed in bed; the temperature of the room should not be allowed to sink below 60° F., and steam should be freely generated in it by keeping a kettle boiling strongly. This may be conducted by tubing to the child's bed, attached to the covering of the cot, which should consist of a blanket, and the steam be allowed to escape there. The bowels should be freely opened, best by a few grains of calomel (grs. iij—v), except in a weakly child; and small doses (ɱ v—x) of ipecacuan wine given every three hours. The food should be hot milk and dry toast, in the first instance. At the same time the throat must be seen to: a sponge, or piece of flannel, wrung out of hot water should be kept at it, and renewed as often as necessary. Two such sponges should be kept going, so that one can be applied as the other is removed, and the water should be as hot as can comfortably be borne. If improvement be not speedy, the doses of ipecacuan wine must be notably enlarged—one or two drachms may be given, so as to induce free vomiting, which seems at once to free the throat, and to promote the action of the skin; after a time it will suffice to keep up the nausea without producing vomiting. On the whole, ipecacuan wine is better than antimonial wine, but if necessary the latter must be had recourse to. If the disease still advance and false membranes form, threatening suffocation, it is better to perform tracheotomy at once—the operation is useless if the disease has gone too far. Every precaution must be taken to preserve the child after operation, for this is even more important than the operation itself. Good food should now be given, including strong soup, and white wine whey, whilst small doses of aromatic spirit of ammonia and ether may be given. Hot-water spray may be tried, if practicable, or the strong liq. ferri perchloridi applied directly to the spot where the false membrane is forming, as long as this can be reached.

The greatest possible care must be taken of the child during convalescence, and any subsequent exposure guarded against to the uttermost for many years after the attack.

PERTUSSIS—HOOPING-COUGH.

To *hooping-cough* are assigned many modes of causation. Undoubtedly it is associated with bronchial catarrh, but a nervous element also enters into it, whether that be hyperæsthesia of the air-passages, or an affection of the vagus.

This malady is undoubtedly a contagious one, but ordinarily occurs in epidemics, and generally attacks children or young persons, but may also affect those more advanced in life. Simple hooping-cough begins like an ordinary catarrh, with slight fever, running from the eyes and nose, and cough with frothy expectoration, but not spasmodic in character. After about two weeks the cough becomes more paroxysmal, it tends more and more to come on in fits, and is not stopped for some time, till the face is flushed and swollen, and the patient seems on the verge of suffocation. Then follows a long inspiration, which gives the peculiar hooping sound, and again the short, sharp expirations of coughing recur till the patient is fairly exhausted. During this period a secretion of a peculiar tenacious viscid mucus takes place. This hangs about the mouth until near the end of the paroxysm, which is frequently terminated by vomiting. Each attack is ushered in by a tickling sensation in the throat. Later the peculiar character of the attack seems to undergo change; though the hoop continues, the attacks are less violent, and the secretion not so tenacious; but there is not unfrequently a tendency for the malady to assume a chronic form. Each attack gives rise to more or less exhaustion, though the patient soon recovers from that. The continued irritability of the stomach acts so that vomiting is easily induced. But as a rule the child will eat immediately after the fit. Unfortunately this is apt to bring on a fresh attack, and so there is always a certain amount of emaciation and bodily weakness from hooping-cough. If strong enough, the child will run about during the intervals of the attacks, but there may be a certain degree of swelling about the face and head, persistent after each attack. From this congestion bleeding at the nose is not infrequent, and often gives great relief. As the disease advances the catarrhal secretion becomes looser and more

purulent, so that it is more easily ejected, and the patient gets well in about six weeks, but relapses are apt to take place except care be taken to avoid them. Hooping-cough is, however, a malady frequently accompanied, or followed, by somewhat serious complications. Naturally it tends to get well in the space of time mentioned—that is, in about six weeks; but the progress to convalescence may be retarded, or the subsequent welfare of the child imperilled by complications. Chief among these are collapse of the lung, with broncho-pneumonia and emphysema.

In weakly, delicate children the violent expulsive efforts of coughing when the air is impelled against the partially closed glottis, so held as to prevent all but a small portion of air escaping at a time, reacts on the lung substance, causing dilatation of the air-cells and the breaking-down of several into one. This is one form of emphysema, but another may be produced by the indrawing power of the forced inspiration drawing a plug of mucus from a larger to a smaller bronchus and fixing it there. The air behind it may escape, but no new air can pass the barrier, and so this portion of the lung is rendered useless. It collapses, and some other portion dilates supernaturally to fill up the vacant space. In this way again, emphysema may be consequent on hooping-cough; but this collapse may also give rise to broncho-pneumonia, and it is only this broncho-pneumonia, which is immediately dangerous; but it may give rise indirectly to emphysema, as we have already seen. Most deaths in hooping-cough arise from these complications. Their existence is indicated by permanent acceleration of the pulse, pyrexia, and dyspnœa. The cough is not always of the hooping kind, but comes oftener. The face becomes dusky, the respiration is panting, and the nose is seen to dilate at each inspiration. There is, moreover, great exhaustion, and moist râles are heard all over the chest. Dulness may or may not be considerable. The temperature is increased. Convulsions too not unfrequently occur, especially in young children when teething, or the subjects of any other peripheral irritation. Acute tuberculosis can hardly be called a complication of hooping-cough, but it is apt to arise in the course of the malady; and if the hooping-cough be not properly got rid of, it may lay the foundation of serious evils later on in life.

The exact cause of hooping-cough is not very easily

made out. It is plain that in it there is spasmodic closure, more or less complete, of the glottis, and there are violent expiratory and inspiratory efforts. These are undoubtedly under the control of certain nerves, but how these nerves are excited, is a question which has not yet been solved.

Treatment.—In simple, uncomplicated hooping-cough the disease may be allowed to run its course, but at the end of that time, to insure escape from any chronic form of cough, it is better that the patient should have a change of air, than which there is no more effectual remedy. In other cases the basis of the treatment is that of ordinary catarrh of the bronchi. If it be necessary to allay the violence of the cough, such remedies as conium (succus conii ʒj or more, according to age), tinct. lobeliæ (about ♏ 5 for a child of one year), tinct. belladonnæ (♏ 2—5), &c., should be tried. A plan not unfrequently successful is to give the child vin. ipecacuanhæ until it vomits, when the fit ceases. Some recommend hydrocyanic acid in minim doses. A mild alkaline beverage, such as still Seltzer water and milk, often seems to relieve the cough. The air the child breathes should be warm and moist, and it should never be exposed needlessly to cold winds. The bowels should be kept open, and as soon as the spasmodic cough begins to subside, tonics, as small doses of nux vomica, zinc, iron, and quinine, should be given. Mineral acids, too, do good, especially about this period. Swabbing out the pharynx with nitrate of silver solution has been proposed, and seems to do good in some cases; but from the disease running the definite course it does, it is hard to assign the exact value to each proposed remedy. The complications must be treated on ordinary principles.

INFLUENZA.

This malady, which is in reality an epidemic bronchial catarrh, sometimes of a very malignant character, gives rise to severe constitutional disturbance. The name *influenza* (Ital. for influence) was given in the seventeenth century to an epidemic malady, the origin of which was so uncertain that it could only be attributed to some occult influence, whence the name. The malady is febrile in character, and specially attacks the mucous membranes

of the respiratory tracts. It lasts from four to eight days, and one attack is no preservative against another, though it is rare that one suffers twice in the same epidemic. Many of these epidemics have been observed and recorded. Some of them have been very fatal, others very slight. Sometimes most parts of the earth's surface have been attacked, at others only small districts. Its spread, too, has varied in rapidity. It is said to have attacked ships at sea when there had been no communication with the shore for many days; but often it seems to spread by personal contact. The symptoms in all epidemics so closely resemble each other that the disease is easily recognised. The attack is usually sudden, as if the incubative stage was very short. Apparently, too, animals may become affected by the disease. Of the two constituents of influenza—viz., fever, and inflammation of the respiratory tract, sometimes the one seems to predominate, sometimes the other. But most frequently the attack is ushered in by coldness down the back, followed by a hot, dry skin, quick, but after a time feeble pulse, headache, and thirst. These may come on gradually, or an individual may suddenly be seized with severe frontal headache. The feverish symptoms gradually pass off in about four or five days, except kept up by some inflammatory affection. The catarrh usually follows, but may accompany the fever. It begins with inflammatory swelling of the mucous membrane in the frontal sinuses, and conjunctivæ, causing pain and heaviness about the forehead, smarting in the eyes, loss of smell, sneezing, and sometimes bleeding from the nose. From the inflamed parts runs a thin acrid discharge, exceedingly irritating. The inflammatory condition extends along the air-passages, and affects the mouth. But the whole tract may be attacked at the same time. This gives rise to sore throat, cough, and dyspnœa. The discharge, at first thin and watery, becomes thicker and more or less purulent. The cough is very violent, comes on in fits, and is accompanied by severe stitchy pains in the side—nervous rather than pleuritic. The lungs are often greatly congested, and aëration of the blood interfered with. These symptoms last from seven to twelve days, according to the severity of the case.

But the special characteristic of influenza is the intense depression it produces. There is complete prostration of bodily and mental strength, with aches and pains

in every part of the body. These may last longer than the other phenomena of the malady, and so delay convalescence. Usually the catarrhal symptoms are the last to disappear; at all events there seems to be left behind an increased liability to catarrhal affections.

In certain epidemics, as that of 1782, the perspiration was so profuse as to have obtained the name of Sweating Sickness. In others, if sweating be profuse, early in the malady, the disease seems to be arrested. It is not a constant symptom. The mortality varies greatly in different epidemics, but it is always much higher if complicated with pneumonia, or occurring in individuals the subjects of chronic bronchitis, emphysema, and diseased and weakened hearts. It is always more fatal in unhealthy localities, and where there is overcrowding.

Treatment.—It has been pointed out as an important distinction between common catarrh and influenza, that whereas the subjects of the former do best kept warm in bed, those ill of influenza require coolness, and plenty of fresh air. Draughts of cold air must, however, be carefully avoided. For the same reason hot drinks are better avoided, and what little food can be taken—for there is complete loss of appetite—should be given iced. Cooling drinks should be given freely, but the use of stimulants requires discretion. When, however, they are seen to be necessary, as indicated by the patient's condition, or if the patient is old, or the subject of chronic bronchitis, they must be given freely and unhesitatingly. The cough, and tough expectoration, may be relieved by inhalation of steam.

As to drugs, a dose of calomel, so as to freely open the bowels, gr. ij—v, given once, but not oftener, is generally recommended at the onset of the disease. Salines are commonly given, whether useful or no. If the lung complication threatens to be troublesome, ipecacuanha may be given (vin. ipecac. ℥x—xv, p. r. n.). Later on opiate may be combined with it. Warm fomentations, mustard poultices, &c. should be freely used for pain in the side, or threatened pneumonia. When the expectoration is profuse in the later stages, senega, with ammonia, and spirits of chloroform may be given, or instead bark and ammonia. As we have had no serious epidemic since 1847, when bleeding was still in vogue, our opinions may be considerably modified by a reappearance of the disease.

In convalescence change of air to a dry, warm climate, warm clothing, good food, and a fair supply of stimulants are advisable. Iron and quinine should also be given. Care should be taken to avoid exposure to cold, damp, or night air.

PAROTITIS, OR MUMPS.

This peculiar malady, mainly characterized by swelling of the parotid glands, is hence commonly called Parotitis, or Cynanche parotidea, and often seems epidemic in character. The disease comes on abruptly, with chilliness, but with no marked rigors, followed by the usual signs of fever. In a few hours one or both of the glands, situated behind the angle of the jaw, begin to swell, whence the swelling seems to spread in every direction. This is at first flat, but after a time it is more prominent, and most marked just in front of the ear. The swelling is firm and elastic, and does not pit on pressure. The skin may be natural or reddened, the redness disappearing on pressure. The swelling lasts from three to six days, remains for a short time stationary, and then rapidly disappears. It may extend to the submaxillary glands. The pain and tenderness are usually severe, especially when any attempt is made to open the mouth. The pain usually disappears before the tenderness. In mumps the jaw is fixed, and the mouth is partially open, any attempts at speaking and swallowing being exceedingly painful; still more so, if possible, is any attempt at chewing, so that there is difficulty in taking food. Occasionally other organs, as the mammæ and testicles, are affected. This is commonly accounted for by saying that metastasis has taken place, but the swelling of the glands of the neck may have subsided before that of the others begins. The glands rarely suppurate, but may remain enlarged and hard for some time after. The malady is contagious, but usually occurs epidemically. It is mostly a disease of youth, but may occur to those more advanced in life. It does not occur a second time, and is most frequent in the spring and autumn.

Treatment.—At the commencement of the disease, the bowels should be well opened, but beyond this purgation does no good. Attention must be paid to the individual's food, which should be liquid or pulpy, and partaken of in

very small quantities or mouthfuls. If there is much pain, opiate poultices or lotions should be applied to the parts. A good lotion is composed of acetate of lead and acetate of morphia. In some cases a couple of leeches remarkably relieve pain. The parts should be rested as much as possible; to this end sucking all drinks through straws will be found a good plan. The same plan may be adopted with soups, &c. Beyond this the malady requires no special treatment.

GENERAL DISEASES.

(E).—MALARIAL AND ALLIED DISEASES.

The term *malaria*, literally bad air, is given to certain unknown conditions most abundant in tropical regions, which nevertheless give rise to an exceeding well-marked group of maladies, to which consequently the term *malarial* is commonly applied. As the peculiar emanations, if we may call them so, which give rise to these maladies, seem most abundantly evolved in the neighbourhood of marshes, the name *marsh miasm* has been given to them. But the same group of maladies may be produced in dry sandy plains, and still more in turning over soils which have been long undisturbed. Malaria acts with greatest intensity in low, hot, and moist situations near the sea, as in mangrove swamps, or in the marshy districts at the foot of hills. Thence, however, it may spread in various directions, but passing over extensive sheets of water seems to arrest it, so too do belts of trees, and as a rule it does not affect people above a certain vertical level. Drainage and cultivation, as has happened in England, banish it from spots where formerly it extensively prevailed, but if these be neglected the fever may again resume its sway, as in the Campagna of Rome. So difficult is it to understand the origin and working of this malaria, that many have been driven to deny its existence; whilst some have sought it in excesses of heat and cold.

The result of exposure to its influence is either to impress on the maladies from which the individual may casually suffer a *periodicity* which is not their own, or to give rise to distinct specific maladies, characterized by fever, which intermits or remits at certain regular intervals.

INTERMITTENT FEVER.

This malady, better known perhaps as *ague*, is the most frequent result of exposure to malaria. The premonitory symptoms may be slight, or they may recur for a day or two before the malady breaks out in force. They consist in some loss of appetite, chilliness, and irregular pains; but the disease really dates from the *cold* stage, which marks its onset. First the extremities become chilly, next the back, and finally the whole body. The nails are blue, the skin shrivelled and shrunken, and frequent rigors shake the body. No amount of external warmth, or of increased clothing can keep up the sense of heat, but if the body be tested by the thermometer it is seen that this feeling is fallacious, for in the axilla it will rise to 105° F., or higher. There is headache, and a feeling of torpor, and with it there may be some degree of urinary irritation. This lasts from half an hour to, it may be, two or three hours, but in chronic cases a much shorter time; after which, flushes of heat alternate with the rigors, and the patient passes into the *hot* stage of the malady. At first this feeling is pleasant as the pulse becomes fuller; but presently the fully developed hot stage shows itself—no longer agreeably, but with intense headache, nausea, and thirst. The patient is now restless, and can bear hardly any clothing. This stage, which lasts from two to four or more hours, in its turn is superseded by another. Perspiration breaks out all over the body, beginning on the head and face; the pulse and temperature fall; the respiration becomes full and regular; headache abates, and presently the patient becomes tolerably well.

The malady leaves the patient tolerably well after each attack at first, but by-and-by, if relief is not obtained, he becomes weakened both mentally and bodily between the paroxysms. This *intermission* is of different lengths: sometimes the acute attack returns once daily, so that an attack and an intermission, the whole not very accurately termed an *interval*, occupy twenty-four hours. Such an ague—*i.e.*, one returning daily at a given hour, is called a *quotidian*. In other instances the attack and intermission occupy forty-eight hours, so that there is an attack every other day; this is called a *tertian*; whilst an

interval of seventy-two hours gives an attack every third day, which is called a *quartan*. Of these the worst and briefest form is the quotidian, the mildest and longest the quartan. Other forms of ague more or less *irregular* are recognised, but they need not be mentioned here. When the disease is advancing it is usual for the attack to come on earlier each day; on the other hand, if waning it will be postponed.

The blood undergoes a change in ague, becoming impoverished to a remarkable extent, especially in red corpuscles. On this probably depends the dirty-yellowish hue seen in those long exposed to malaria, as it may itself depend on important structural alterations in the liver and spleen. The spleen is enlarged and softened in recent cases, it may even be reduced to a pulp; but in chronic cases, though enlarged it is also hardened, and deeply pigmented. The liver in recent cases is also large and soft, and of a deep purple colour. In the cold and hot stages of ague the quantity of urine is increased; it is invariably acid, and contains more urea than during the intermission.

There should be no difficulty about the diagnosis of an ague.

Treatment.—It is a common practice to begin the treatment of all such maladies with an emetic and a purgative. Of course such practice is good if necessary, but certainly bad if unnecessary. Little good is to be done during the ague fit. If the cold stage threaten to be too long, the use of a stimulant may become necessary, and the same should be given if there is much debility in the second stage. With the intermission comes the time for action; it is of vital importance that no *habit* should be acquired, so that the sooner the fits are stopped the better. To this end quinine should be given in large doses, beginning with one of not less than ten grains, and the patient should always have thirty grains in all before the fit has time to come on again, due allowance being made for the time in which it may take effect. It is best given with a few drops of dilute sulphuric acid in water. It is said that tincture of orange-peel best covers its taste, but that to many is not objectionable. If there is much irritability of stomach quinine must be given hypodermically. By such means a second attack may be prevented, a third ought certainly to be so. The prophylactic virtue of quinine is now admitted to be of great importance, and in this way it is used in the army

and navy. After quinine comes arsenic as a remedy, but this is not so good, except in certain forms of malarial neuralgia. Of the very utmost importance is good and nutritious food, still more change of climate. To get rid of the malarial poison is not easy, but steady living, exercise in the open air, with due care in the matter of warm clothing, will in time eradicate it. For enlarged spleen the ointment of the scarlet iodide of mercury is used in India with great success—a portion the size of a large bean is to be well rubbed in before the fire, or in the sun. A few applications effect wonders.

REMITTENT FEVER.

This malady, also known as *bilious remittent*, or *jungle fever*, is a much more serious one than ague. Though due to the same or similar causes, it expresses a higher degree of potency in the poison, and is correspondingly fatal. In ague there is always a distinct intermission, a period when there is no fever, but in remittent fever there is only a period when the degree of pyrexia is less than during the height of the attack, and that may be faintly marked.

This form of malarial fever, though most common in hot regions, is by no means limited to them. It ruined our army in the expedition to Walcheren, and again in Spain and Portugal. It is also common in America, but is most virulent on the swampy coast of Africa, the jungles of India, and in some parts of the West Indies. As in other malarial diseases, remittent fever comes on with signs of gastric disturbance, loss of appetite, nausea, and pain and weight at the epigastrium—especially the last. The onset is not so marked as in ague, especially as regards the cold stage. This may be only represented by passing chills, followed by or alternated with flushes of heat, and, as in ague, the sensation of cold is not real, for the temperature is elevated, not depressed. As the hot stage becomes more fully developed, the temperature rises to 105° F., 106° F., or more. Vomiting too is an early and troublesome symptom, but the oppression at the pit of the stomach is not relieved thereby. The pulse rises to 100 or 120, the face is flushed, and there is intolerable headache, whilst there are also pains in the back and limbs. The sufferings from bodily heat are excessive, and the

patient is exceedingly restless. After from six to twelve hours of these sufferings they begin to abate. The first indication is a slight dew on the neck and forehead, gradually spreading over the body, a fall in temperature, a fall in pulse, and a feeling of less bodily heat. The stomach is also quieter and the headache less. Often this ends in sleep. Such is the period of *remission*, and, as is the case with regular continued fever, it commonly happens in the morning, but it may not do so—hence its occurrence should be eagerly looked for, as it is on the treatment adopted during this period that the patient's safety hangs. The remission lasts a variable period—the longer the better. Then comes the *exacerbation*, and the whole series of phenomena have again to be gone through. Sometimes there are two attacks in one day with a morning and evening remission. In ordinary cases, if not cut short, the malady may be said to last from five to fourteen days, and usually ends in recovery.

Some of the most troublesome symptoms are the nausea and vomiting, which not only exhaust the patient, but prevent nourishment and medicine from being retained long enough to do good. The vomited matters soon become bilious, and are in extreme cases almost as black as the dreaded *vomito prieto*. Hiccup is also troublesome, but perhaps the worst symptom of all is the headache, which is sometimes almost unbearable. The bowels are as a rule constipated, but the reverse may be the case. Inflammation of the liver is a rare complication, but a slight degree of jaundice is common. Enlargement of the spleen is not so marked as in ague.

The diagnosis of severe bilious remittent from yellow fever is not always easy, and enteric fever has been taken for the former. Both these are essentially continued fevers —remittent, however little so, is essentially periodic. In cases, however, such as used to be seen, when a scorbutic or purpuric condition existed in those attacked with tropical remittent, it would not be easy to distinguish it from some forms of yellow fever. (See YELLOW FEVER.)

Treatment.—The grand rule in remittent fever is this—wait for the remission; then give quinine in full doses.

It is true, a good deal may be and is done to alleviate suffering during the febrile paroxysms, but as far as cure is concerned it rests on the above maxim. The old practice of bleeding and giving calomel is fairly exploded. As in all other fevers, good ventilation is important, all the more

so, of course, as these maladies are most common in tropical regions. On the onset of the disease the condition of the bowels and stomach should be inquired into. Seldom is an emetic necessary—vomiting is only too troublesome—but a dose of calomel and compound powder of rhubarb may be given—gr. 5 of the former to gr. 10 of the latter. When the hot stage is fully developed, and if the heat of surface be great, tepid sponging helps to relieve it. Some authors recommend the use of the cold pack—that is, a wet sheet wrapped tightly round the individual and covered with a blanket. Under proper supervision this may do good, but its use requires judgment.

When the remission appears (and it should, as above said, be carefully looked for) it may be slight, and the slighter it is the greater is the risk from the fever. A dose of quinine should be given varying from 10—30 grs., according to the severity of the symptoms. It is common to say that quinine does no good with a foul tongue; this is not so in this malady. If the dose cannot be retained, a smaller quantity, dissolved in the least possible quantity of acid, neutralized to the verge of precipitation by liq. ammoniæ, is to be administered subcutaneously. In this way five grains should suffice; it may be given by several punctures. Some prefer giving a large dose by the rectum, suspended in a mucilage of starch. Ringing in the ears, and some degree of deafness, are the signs that the quinine has taken hold of the system. Next time the remission appears it will probably be more marked, and again as the sweating stage appears is quinine to be given in full doses. Vomiting is often troublesome, as already said; for it, ice, a flying blister over the epigastrium, and spirit of chloroform, or three or four drops of dilute hydrocyanic acid, are the best remedies, but these are only palliatives —quinine is the remedy par excellence, for vomiting and everything else. The remission too is the period for giving food, but in the worst forms it must not be waited for, even to give quinine. Perhaps in these, the subcutaneous plan of medication would be the best. Stimulants too in the form best suited to the patient's wants must be plied in these cases.

There is a secret remedy highly spoken of by some in the treatment, even of the worst forms, of remittent fever —that is, Warburg's Fever Drops or Tincture. It acts as a powerful sudorific, and according to the testimony of

those well worthy of respect, is an admirable remedy in such complaints.

DYSENTERY.

This malady, also known by the name of the *Bloody Flux*, is undoubtedly allied to the malarious group of diseases, although its symptoms be altogether different from these. It may prevail in an epidemic form, and together with typhus and scurvy, has constituted the great scourge of ancient and modern armies. It is now rare in this country, save when imported, though at one time it used to be rife.

Dysentery may begin like an ordinary diarrhœa, or it may at once declare itself unmistakably. The patient is griped, and it may be passes an ordinary copious, loose, fæculent motion, containing more bile than usual, and somewhat irritating. Then there may be repeated calls to stool, with much griping and straining. In any case the stools speedily become scanty, almost entirely consisting of mucus and blood. The odour is peculiar, and especially in chronic cases, exceedingly offensive. The degree of the affection varies exceedingly, from something a little more serious than ordinary diarrhœa, to a most malignant and fatal malady. In the milder cases the most striking symptoms are griping pain (*tormina*), especially after taking food, and some straining (*tenesmus*), which however with appropriate treatment, speedily subside.

The disease in the acute form is much more severe. There may be a well-marked chill to begin with, followed by pyrexia and quick pulse. In such cases, the characteristic stools are speedily established, and from the first are notable for their exceedingly disagreeable smell. The calls to stool are very urgent; at last the patient can hardly be got to quit it, whilst the violent straining only increases the desire for evacuation. The abdomen is tender; the pulse increases in rapidity as it loses in strength, and soon tympanites declares itself. The tongue becomes dark or even black in the centre. The stools change first to pulpy shreds, like raw meat; after to a brown, copious, serous kind of fluid, horribly fœtid. By-and-by (an evil omen) the pain ceases, but presently delirium comes on, often of a pleasant kind, and the patient sinks exhausted. In favourable cases the later stages are not reached; the stools improve, and begin

again to have the true odour of fæces, the abdomen becomes less swollen and tender, the depression passes off as the pulse falls, and the fever passes away. In too many cases, however, especially abroad, and among soldiers and sailors, what from exposure to malaria, what from imprudences in diet, the malady often tends to become chronic; then the condition of the patient is truly deplorable. The discharges may improve somewhat, so as to become partly fæculent, but they still retain their disgusting odour, to plague the sufferer and all around him. The stools in this condition are of the most varied kind: mucous, serous, bloody, frothy, or fæculent; they vary from day to day. The appetite may improve, but the patient does not gain flesh; he looks thin, worn, and irritable. The tongue is glazed and red, sometimes fissured, the patient becomes preternaturally aged, and sooner or later sinks from exhaustion or from some intercurrent malady.

Very frequently abroad in tropical climates, where both dysentery and liver disease are common, the two are combined, adding greatly to the danger of the malady. Such a combination has been thought rather a sequence, that the liver disease was infective, and due to absorption of purulent or other matters from the diseased intestine. Such, however, is not the general view now held. Where the individuals attacked have long been subjected to trying and weakening influences, especially as regards damp or wet, the dysentery may assume an excessively aggravated form, to which the name of malignant dysentery has been given. The combination of dysentery and scurvy has already been alluded to. Impure water, and exposure to night cold, have much to do with the generation of this disease in certain localities.

As regards the diagnosis of dysentery, that can hardly be difficult as soon as the disease has pronounced itself. There are the peculiar stools, the straining, and the griping, all quite characteristic, especially the odour of the first. The site of the lesion in dysentery, except in its most malignant form, is the great intestine; sometimes, however, in camp dysentery, it extends into the small intestine. First of all there seems to be some swelling of the mucous membrane with discoloration, not of a uniform character, but varying from red or purple to a brown and leaden hue. The follicles of the intestines are enlarged, and it is round about or in these that the ulcers form.

These ulcers are first of all circular, with rounded or flattened edges, afterwards perhaps excavated, but they speedily become irregular in shape, for the most part running in the direction of the folds of the intestine. They may be found of all shapes and sizes, and all degrees of development, some deep and some shallow. In many cases they are apparently produced by sloughing of the mucous membrane, which may become gangrenous. The coats of the intestines which remain, become in long-standing cases greatly thickened, so that the gut may be easily felt through the emaciated parietes. In favourable cases these ulcers heal by a gradual spreading of new tissue from the edges of the ulcers, after these have become rounded and healthy. In chronic cases it is possible for the whole ulcerated surface to become cicatrized and yet the disease to persist; but it is far more common to find ulcers in every stage, some healed, some quite fresh. The coats of the gut too may be thinned, but are more likely to be found thickened. A kind of false membrane too may be found covering some portions of the surface of the gut, and this too may ulcerate. The frequent association of liver disease with dysentery in tropical climates has already been alluded to. Such connexion is not common in temperate regions.

Treatment.—In tropical dysentery early treatment is all in all. It is, too, very important to get the skin to act freely. To this end a warm bath, and twenty or thirty grains of ipecacuanha are recommended. If the patient lies perfectly still and takes no fluid, this large dose may produce little or no nausea. In about eight hours the dose of ipecacuanha is repeated. To relieve the griping, turpentine stupes may be used, and a small dose of castor-oil with ten or fifteen minims of laudanum will probably now succeed in again bringing on fæculent motions. Occasionally it is necessary to give a dose of opium, such as twenty or thirty minims of the liquid extract, to quiet the stomach under the ipecacuanha. To that end the opium should be given first; but quiet and a little ice will generally suffice. The ipecacuanha must usually be given for a day or two after the subsidence of the acute symptoms, but in reduced dose. Astringents are not to be used, except in cases where ipecacuanha is not well borne. Where malaria is at the root of the mischief, quinine must take the place of or alternate with the ipecacuan. When scurvy is combined with dysentery, the free use

of fruit is desirable; grapes have a high reputation in this way. In the dysentery we see in this country, Dover's powder, with castor-oil and laudanum, are the best remedies. In chronic dysentery, ipecacuanha with the perchloride or pernitrate of iron is the best and most appropriate treatment.

THE DENGUE OR DANDY FEVER.

This epidemic disorder occurs chiefly in tropical climates at considerable intervals. When it appears it generally attacks the greater part of the population, but rarely if ever proves fatal. It comes on suddenly with lassitude and drowsiness, speedily followed by terribly severe pains in the head, back, and limbs. These may appear quite suddenly, and are always marked, whence the title of *break-bone fever* sometimes given to the disease. In a day or so there is a distinct remission of all the symptoms, but much languor and lassitude remain. About the third day there is a relapse with a well-marked skin eruption, something like that of scarlatina and measles. This remains only for a day or so, and then the cuticle desquamates with considerable soreness or itching. This again is followed by a remission, but there may be a second or even a third relapse. There is always loss of appetite, and disordered stomach during the attacks. Each attack seems to occupy a period of about three days, and the convalescence is usually protracted. Quinine and iron are indicated during this period. During the primary attacks anything which will relieve the local pain may be prescribed.

GENERAL DISEASES.

(F).—ENTHETIC DISEASES.

There is a tolerably well-marked group of maladies, all characterized by this—that they are the product of a distinct and specific poison, which must be introduced directly into the system before they can be developed. Several of them are propagated by poisons only developed in the lower animals—such are hydrophobia and glanders—but others are the results of special poisons developed in human beings, notably syphilis.

GLANDERS OR EQUINIA.

Glanders is a malady which originates in the horse, mule, or ass, and which can only be communicated to man by the introduction of the discharges, from these animals, in a state of disease, into his system. The same disease in another form goes by the name of Farcy; this is equally inoculable, either by sores or by mucous membranes. Glanders may be transmitted from one individual to another.

If the disease has been introduced through an open wound that may inflame, and the lymphatics swell, but constitutional symptoms may be the first indication of the attack if the mucous and other surfaces be entire. There is then fever, beginning with rigors, lassitude, and general uneasiness. Many abscesses form, especially in the neighbourhood of joints, and in the face. These constitute at first hard masses, but open by sloughing, and a thin fœtid pus wells out. They tend to spread, and to penetrate the deeper parts. Pustules form on various parts of the body, especially the limbs; these are sometimes accompanied by bullæ, whilst an erysipelatous inflammation

invades the face and extends to the forehead. The most characteristic sign, however, is the discharge of a thick, fœtid, purulent matter, often bloody, from the nostrils, the result of pustulation of their lining membrane. The pustules, which are of the size of a hemp-seed or pea, are at first hard, but afterwards undergo change and break down. The same pustules, or ulcers form in the mouth. The prostration is great, and as the pustulation seems to extend to the internal mucous membranes, giving them a worm-eaten appearance, and laying bare cartilage and bone, together with fœtid breath and diarrhœa, it increases, ending finally in death about the second or third week.

In *farcy* there is no discharge from the nostrils, and no ulceration. Often there are only lymphatic swellings, and it may or may not be accompanied by eruption. When the malady is chronic, these lymphatic swellings open and form foul, intractable ulcers. From the chronic form recovery sometimes takes place, but it is apt to end in some acute variety of the malady, and then proves invariably fatal.

The *treatment* is purely symptomatic. Prevention by the speedy destruction of all diseased animals should be aimed at and rigorously carried out.

HYDROPHOBIA OR RABIES.

The peculiar malady called *hydrophobia*, like the preceding, can only be produced by the inoculation of a specific poison, which has been generated in animals of the cat or dog tribes, especially dogs, wolves, foxes, cats, and martens. When these animals become what is termed mad or rabid, whether by inoculation, or which is more doubtful, by generation of the poison within themselves, they develop a poisonous substance contained in the abundant saliva, and this being introduced into other animals or into man, usually by the teeth in biting, gives rise to the characteristic symptoms of rabies or hydrophobia. This poison is non-volatile, and, like other animal poisons, is destroyed by heat, and a variety of reagents.

Not every person who is bitten by a mad dog suffers from hydrophobia. Various reasons may be assigned for this, but the most important doubtless is the fact that most parts of our bodies are covered, and in passing through our clothing so as to reach the skin, the teeth of

the animal get wiped of the adherent saliva, in which alone is contained the poison. The danger is greater if the face or hands are the parts injured, but in no case can the poison act unless applied to a raw or abraded surface; it cannot pass through the sound epidermis. Extraordinary tales are told as to the period of incubation of hydrophobia. It is better to believe that the individuals, who ultimately became its victims after long intervals of time, were in some way infected at a period of which they were ignorant, than that the poison should have lain dormant in their systems for many years. It is true that the development of hydrophobia is unusually long delayed in many cases, but in most it appears in from four to eight weeks after the receipt of the injury.

During this period the wound may heal, or may remain open and irritable. At all events, when the constitutional symptoms begin to show themselves, the part becomes painful, and if open unhealthy. The patient is peevish, irritable, and extremely depressed; the skin hot, and the pulse quick. The first motor imperfection is involuntary long inspiration, with great depression of the diaphragm, and violent, almost spasmodic raising of the shoulders. Next set in stiffness of the neck, and difficulty in opening the mouth, with painful spasm of the muscles of the pharynx when the subject tries to eat, or still more to drink. This, however, is in part due to the rigid distension of the chest alluded to. The thirst is great, but the pain in attempting to swallow is too great for the thirst. The patient dreads the sight of water (*hydrophobia*). Even the sight of bright objects, or a draught of cold air brings on the painful spasm—the very thought of drinking does the same. The saliva becomes exceedingly viscid, and difficult of expectoration. Sometimes the patient is delirious, sometimes he is quiet. Frequently there are convulsions, often coma. Finally the jaw drops, the saliva flows from the corners of the mouth, and the patient sinks to death, generally within forty-eight hours of the onset of the constitutional symptoms, by far the most frequently from utter exhaustion; much more rarely in a fit of spasm. Often, indeed, the patient seems on the point of recovery, but it is only the calm before death.

Treatment.—When fully developed there is but one end to this malady—death. All our efforts, therefore, must be concentrated on averting its occurrence. When

bitten by an animal in the slightest degree suspicious it is better to excise the part deeply at once. If that cannot be done, the free use of a caustic, which will permeate every cranny of the wound, should be had recourse to. Of these perhaps the best are strong sulphuric or nitric acids; potassa fusa is perhaps more manageable, but not so powerful; chloride of zinc is too slow. Experience has, however, shown that cauterizing with solid nitrate of silver may be quite sufficient, if properly done, but it is not advisable to run risks in such a disease. In any case some steps should be taken.

All kinds of specifics have been recommended for hydrophobia; all are useless. When the disease has shown itself, all we can do is simply to mitigate the sufferings of the patient, in every way we can conceive, especially by the use of narcotics or anæsthetics.

CONSTITUTIONAL SYPHILIS.

The most important of the enthetic diseases affecting humanity is *syphilis*. It has been likened to an exanthematic fever, seeing that its most characteristic sign of constitutional implication is some form of rash. It is, however, very much more protracted in its development than ordinary exanthemata, counting by months or years instead of days. Like them, however, an exceedingly small quantity of the poison can breed within the body into enough to affect the whole system, and infect a whole multitude; whilst a single attack if it does not guarantee against a return of the malady, at least renders it exceedingly unlikely.

With the phenomena of inoculation—which is commonly called primary syphilis—we shall not here concern ourselves, beyond insisting on the fact that the disease may be perfectly innocently acquired. But after the appearance of a true chancre, a considerable interval usually elapses before anything else is notable beyond the enlargement of the glands in the groin, not in isolated masses, but in a continuous chain. During this interval, which averages six weeks, the patient is languid, easily tired, and suffers from pain in the back, especially towards the close of the period, and the glands may become enlarged in various parts, especially at the back of the neck, and in the axillæ. But one morning the patient wakes, and finds his body

covered with a rose rash very slightly elevated above the surface, and which is called *syphilitic roseola*. This rash is most marked on the belly and chest, and never attacks the hairy scalp. At the same time the patient is conscious of some pain and stiffness about the throat, and on examination the fauces are found red, and somewhat swollen, much as if the tonsils and soft palate were affected in the same way as the skin. All these symptoms gradually depart, especially if aided by judicious treatment, but it may be only to be succeeded by others.

Such is the history of the outbreak of the simplest syphilide, an outbreak often entirely overlooked, especially in patients of not over-cleanly habits. Very often, however, the rash is considerably elevated above the surface, or it may even be papular, or papules (*lichen*) may succeed to the roseola. Frequently when these papules are disappearing, they leave behind a scale or two, on a coppery-looking surface; to this, too, a specific name has been given, often erroneously; it is called *lepra*. Often these eruptions break out in circles and spread outwards. In other cases the earliest eruption may be half papule, half pustule, or wholly pustular; in others still, vesicles or bullæ. Broadly it may be stated that the earlier these last appear (for all may come in due course), the worse is the case, whether that be due to the virulence of the specific poison, or the bad constitution of the recipient. The more aggravated forms of the syphilitic eruption, especially the bullous and pustular, are accompanied by well-marked ulcers of the throat, the appearance of which is very characteristic—they are round or oval, with sharp edges and tawny-grey bases. These ulcers are not painful. The simpler form of syphilides depart, and leave no mark, save a coppery discoloration, which in its turn departs; but the vesicular, pustular, and bullous especially, leave behind well-marked scars, first coppery, later of a dead-white hue.

Other portions of the mucous membranes besides the fauces may be affected. The edges of the tongue often suffer; depressions or fissures form there which are exceedingly painful; cracks at the corners of the mouth form with elevated edges, and something of the same kind occurs in the region of the anus, or on the scrotum or labia. These elevations are called *mucous tubercles*, and their discharge is as contagious as is that of a primary chancre. The moisture of these parts has a material in-

fluence on the formation of such form of eruption. The hair often falls during this period, but always returns of its own accord.

During the same period, which is commonly called that of secondary symptoms, there is frequently set up an inflammation of the iris, which requires to be looked after.

Later, when a tubercular or bullous eruption has made its appearance, a new set of symptoms supervene. Very probably there is some swelling of the testicles, and presently nodular swellings begin to appear under the periosteum of the long bones: sometimes also on the head. These are very tender on pressure, and exceedingly painful at night. They may soften and ulcerate, and the bone beneath them become dead. This is often the case in the hard palate, pharynx, and nose. During this period too, which is called that of tertiary symptoms, a similar formation of what is called *gummy matter* may take place in various internal organs—in the liver, spleen, or cerebral cavity—giving rise, in the latter instance, to symptoms of cerebral or neural pressure varying according to localization. This period too is marked by serpiginous ulcers in the skin and mucous membranes. Though the development of syphilis has been here spoken of as consecutive, that is by no means invariably the case. Thus a man may have a roseola or a lepra, and see nothing more of his malady for years—perhaps, for ever. But again, when once attacked, he may never be free from it; and this is especially the case if the later enumerated syphilides appear first. In no case do the earlier eruptions appear after the later, whilst frequently many years may elapse with no sign of the disease, and yet the malady recur in some of its more advanced shapes. Tertiary symptoms, once they have appeared, have a remarkable tendency to recur in the same or other forms.

A question seemingly very useless has often been discussed. Practically the question amounts to this, Can syphilis be itself, and at the same time something else? Put in this way the question certainly looks absurd, but even as usually put it is not one whit more absurd. Syphilis is a specific disease, running a determinate course, during a longer or shorter period, and capable of being interrupted, or for a time made to diverge from this course, but as a whole its specific character is unmistakable. But every sore on the genitals is not syphilitic. A person may have sores on these parts as on any other part of the body, and if these sores be inoculated with foul irritant

matter, there may be glandular inflammation in the groins, probably ending in suppuration. But he may have the same, if a similar accident happens to any part of the lower limbs, and to medical students, unfortunately, still more evil examples of such accidents are afforded in dissection wounds and axillary buboes. No one, however, would say that these had the slightest resemblance to syphilitic infection.

Much time too has been wasted in attempting to make out some connexion between the violence of the disorder, and the nature of the infecting sore, or even to establish different divisions of the malady by the nature of their manifestations; but we may see a mild attack or a malignant attack of the great pox, just as we may see this in the case of the small-pox. Much may depend on the virulence of the infecting agent, more perhaps on the constitution of the individual infected. Again, as regards the mode of infection, some have supposed that the existence of a sore was necessary for the production of the special poison, but this is not so. A fœtus may be rendered syphilitic by either parent; or being rendered syphilitic by the father, may communicate the disease to the mother, and all this without there being open sores. It is well known that the discharges of certain moist secondary eruptions, notably mucous tubercles or condylomata, are quite as contagious as those of a primary sore; and the foul discharge of a thoroughly syphilitic woman may, if it can make its way through the skin, infect a male as readily as the thin watery discharge of a hard chancre.

One of the saddest forms of syphilis is that acquired by inherited taint. In many instances the diseased ovum is thrown off, probably about the sixth or seventh month of pregnancy; but if this be passed, the child may be born alive, sometimes with a skin eruption already developed, though most frequently this is not so; the child when born may look perfectly healthy. In ten days or a fortnight, however, an erythematous or papular coppery rash begins to appear; at the same time there is well-marked inflammation of the mucous membrane of the nares, with a profuse discharge. This, as the infant breathes only by its nostrils, causes with each respiration a snuffling sound, whence the name "snuffles" has been given to the condition. The outbreak of other secondary symptoms is most frequent about the sixth week or second month—one of the most common forms at this period

being condylomata round the anus. The child may look perfectly healthy, and have no other sign of the disease, so that it seems hard to believe such an infant to be syphilitic. But seen later, if no treatment has been used, there is little doubt left: the child wastes and shrinks, the stomach and bowels become irritable, so that it can neither retain nor digest its food, and a look of premature senility comes over it. Many such infants die, some get better; if so, they become anæmic, with scars where the sores have been, and an expanded bridge from inflammation of the nose. But later on the taint is still shown by notched or pegged incisor teeth, especially in the upper jaw, a prominent forehead, the remains of syphilitic keratitis, with, it may be, nodes on the long bones, and, should the internal organs come to be examined, an amyloid condition of the liver, spleen, &c. Frequently too such unfortunate patients are the subjects of more or less complete deafness and blindness, with a marked liability to epileptic fits.

The diagnosis of constitutional syphilis is not easy, but it is very important. The more so that we may meet with it in the most unexpected quarters, where questions pointing to its mode of origin would only mislead. Syphilis, though usually acquired in one way, may be so in many others; and it is quite possible for one, who honestly believed that he had been completely cured of his malady, to communicate it to perfectly innocent parties. Women and children are the chief sufferers in this way. We must therefore be in a position to diagnose the existence of syphilis, not only without, but in spite of the patient's or parents' testimony.

In the secondary stage the difficulty is not, as a rule, great. We have an eruption generally tolerably characteristic, especially as regards its coppery tint, its symmetrical distribution, and its changing type. At the same time, the condition of the throat as regards ulceration should be attended to. The coppery markings on the skin generally remain long after the true eruption has disappeared. The dull white cicatrices left after some of the ulcerative syphilides are very characteristic. In the tertiary stage the tendency to nodes, bone disease, nocturnal pains, and the existence of a cicatrized palate, are things which may enable us to make out the disease, though for years there has been no sign of it, and where there may be no history of the disease at all.

The true syphilitic sore is often overlooked; it may give rise to little inconvenience, and it is frequently impossible, even when the patient has got not the slightest object in deceit, to obtain a history of primary syphilis, when secondary and tertiary symptoms are unmistakable. No absolute rule for diagnosis can be laid down, but the student should be encouraged to the utmost to take advantage of every opportunity of improving his knowledge on this point. It is a knowledge which comes of observation and not of books.

Treatment.—As in most other subjects concerning syphilis, many a battle has been fought concerning treatment, and yet the matter seems simple enough. Nobody would, as a matter of course, give mercury for every sore on the genitals, any more than they would for a cut on the point of the finger; but few men, if there were not some good reason for it, as a scrofulous or other form of weak constitution, would abstain from giving mercury in syphilis. Is there an absolute necessity for giving mercury? Can syphilis get well of its own accord? Undoubtedly syphilis tends to get well, just as typhus and measles tend to get well, though after a much longer period; but syphilis may also kill, just as these maladies may, it may be by the virulence of the disease itself, though this nowadays is rare, or by some of the complications or sequelæ with which it is associated. On this most men are agreed: that in appropriate cases mercury does good. That being so, the question arises, how best to give mercury. Though most are agreed as to its efficacy, men differ as to the degree of this, but we may fairly say that it does not in most cases prevent the appearance of secondary symptoms. That being so, there is no necessity for hurriedly getting the system under the influence of mercury, or of saturating it with the drug. Syphilis is essentially a disease of slow development, its course extending over months and years; so ought to be its mode of treatment. To subject the patient to a mercurial course till his breath is stinking, his teeth loose, and the saliva running from his mouth, so that he can hardly eat a morsel of food, is to do him the greatest possible harm. It weakens him in every way. Mercury ought to be given in such a way that it will not interrupt the appetite for food or the process of digesting it; and as this can hardly be if we give it by the stomach, in the ordinary fashion, we must seek some other mode of

employing it. Of all these, that which most commends itself to us is inunction. There is only one objection to this plan: it is undoubtedly nasty, especially in warm weather. Under such circumstances the mercurial vapour bath may take its place; but either of these is superior to the plan of dosing the unhappy patient with calomel and opium. A milder mercurial is grey powder with Dover's powder, but sooner or later these too upset the stomach, and destroy appetite. A much better plan is to give the liquor hydrargyri perchloridi in 3j doses along with some vegetable bitter. This may be continued for a long time with benefit. If inunction is to be used, a portion of unguentum hydrargyri (blue ointment) the size of a hazel-nut is to be rubbed into either groin, and either axilla every night. The ointment is to be allowed to remain on the skin all night and washed off in the morning in a tepid bath by means of the ordinary carbonate of soda (not the bicarbonate) used for washing and such like domestic purposes. This treatment may go on for some time till the gums become affected; it will then be quite enough to use the ointment once or twice a week, or the perchloride may be given internally for a time. It is otherwise, of course, where some inflammation, as iritis, threatens dangerous consequences locally; then whatever may be done to bring the system under mercury speedily should be tried.

Some of the local eruptions in syphilis are exceedingly troublesome; such are palmar and other forms of psoriasis, and the coppery-coloured blotches of lepra on the face or hands. To such, as well as to other painful varieties of skin eruption in syphilis, mercurial ointment should be applied and well rubbed in. Upon the whole, the ointment of the red oxide, or of the nitrate is the best for this purpose, though some prefer the ordinary blue ointment. Sometimes a saturated solution of corrosive sublimate is the best application.

The practitioner must use his judgment how long mercurials are to be continued, but if the stomach gets irritable, they had better be left off, and an alkaline bitter infusion given for a time (liq. potassæ ℥x, spirit. ammon. aromat. ℥ss, inf. gentianæ ℥j; ter quotidie ante cibum). In all cases whenever discontinued, mercury should be followed up with quinine and iron.

But as time wears on, and the later syphilides declare themselves, after it may be a long intermission, brought

on perhaps by privation, exposure, or ill-health, we find that these are not nearly so amenable to mercurial treatment, which, besides, may be forbidden by the condition of the patient. Even in the well-marked tertiary stage, if the patient has had no mercury, and if his general state of health does not forbid it, it is better to give mercury. Now, however, it should be given in combination with iodide of potassium, the latter being in excess, so as to render the double iodide soluble. In this way, liq. hydrarg. perchlorid. 3j and potass. iodidi grs. x—xv may be given in some vegetable infusion, as gentian or calumba. (N.B. The double salt precipitates an alkaloid, so that it cannot be given with bark.)

When the tertiary symptoms, as nodes, serpiginous ulcers, rupia, and destruction of bone appear, mercury had better be abandoned, if it has been well tried before, for iodide of potassium and cod-liver oil. Over this stage of the malady iodide of potassium exercises a wonderful control, but it must be given in full doses. Doses of this remedy which in other cases would give rise to running from the eyes and nose, skin symptoms, and the like, are well borne in tertiary syphilis. It is hardly worth while beginning with less than 15 or 20 grs., and the quantity may be increased to 30, 40, or even 50 grs. three times a day. For the ulcers themselves, in the mouth and throat, nitrate of silver in the stick is the best application, not lightly, but thoroughly used, and then to wait till the slough separates, gargling with warm water meanwhile. Externally, corrosive sublimate lotions are best; we have sometimes used it even in the solid state to keep down rupial scabs. To remove these the scab should be covered night and day with lint soaked in equal parts of glycerine and liquor potassæ, and as the scabs fall off, the corrosive sublimate should be applied. With these remedies, vigorously used, whilst the patient's general condition is attended to, we can generally keep tertiary syphilis well in hand.

What is to be done if the patient's health forbids the use of mercury? Assuredly in strumous subjects it generally does harm. In such cases we can only do our best to keep up the patient's strength, and let the disease run its course. As soon as the malady tends to pass from the scaly or papular form of eruption to the moist or pustular, mercury should in any case be dropped, and iodide of potassium with bark and cod-liver oil substituted.

PARASITIC DISEASES.

An exceedingly well-marked group of diseases are those produced by parasites, animal and vegetable. The exact influence of vegetable parasites, especially the fungi, is not yet known, and very probably is much greater than is even now imagined; but we must deal here only with well-ascertained facts. The best known of the animal parasites are those which inhabit the alimentary canal. Their complete history is not yet as satisfactory as could be desired, but the symptoms they give rise to are sufficiently well known.

TAPEWORM.

Tapeworms (tæniæ), so called from their riband-like appearance, are not unfrequently found in the human alimentary canal, or are expelled therefrom. Two of these occur much more frequently than do any of the others: these are Tænia solium and T. mediocanellata: a third variety, Bothriocephalus latus, is found in certain districts abroad. The T. solium, the common tapeworm of this country, is composed of some hundreds of segments, and may measure as much as thirty feet or more. At the small end is the head, somewhat triangular in shape, with four cups or suckers, and a proboscis with a double row of silicious hooks. The neck consists of no visible segments; these are indicated only by transverse markings. The segments lower down are mostly square or oblong, but some are much longer in comparison with their breadth than others. Each mature segment contains both male and female organs of generation, the openings of which are in the margin of the segment. The ripe segments, which are near what might be called the tail of the animal, are

full of eggs, and are thrown off one after another and expelled with the motions. These bodies so expelled are called *proglottides* or *cucurbitina*. By one means or other the coverings of these perish, and the ova are set free. Most of these are destroyed, but some make their way sooner or later into the alimentary canal of an unwilling host, and there the contained embryo is set free. This makes its way into the fleshy part of the animal, where it becomes cystic and rests for a time. Beyond this stage, however, it cannot go until it reaches an animal in which it can be developed as a tapeworm (this is usually a flesh-eating animal), habitually preying upon the animal in which for the time it rests as a cystic worm. The Tænia solium rests in the pig as the Cysticercus cellulosa, giving rise to the appearance in pork called "measly." The cysticercus of the T. mediocanellata, on the other hand, rests in oxen, and makes its way into man in imperfectly cooked veal and beef. The mature T. mediocanellata has no hooks, only suckers. It is rather larger than the T. solium. The Bothriocephalus is only known in this country as an importation. It is common in Switzerland, East Prussia, Poland, and some parts of Russia, Sweden, and Denmark.

The symptoms of tapeworm are often obscure. The patient is distressed and fretful, complains of irregular pains in the bowels, unusual hunger, and the like, but the diagnosis is usually settled by the passing of segments or ova from time to time. If necessary a sharp purgative may be given to clear up the diagnosis.

Treatment.—This resolves itself into prevention and cure. Prevention means the careful selection, and proper cooking of the meat we consume. Remedial treatment too is satisfactory. The remedy most used in this country is liquid extract of male fern (dose ʒj), to be given fasting and followed by a dose of castor-oil. Another very good remedy, where it can be kept down, is ol. ricini ʒss, ol. terebinthi. ʒss. M. To be taken fasting. Kousso and Kamela are doubtless good remedies where attainable with ease and cheapness, but those given are quite good enough, and efficacious enough to please all.

HYDATIDS.

What are commonly called in medical phraseology *hydatids*, are in reality immature forms of some of the animals which when mature we call tapeworms. They are in the resting stage, and have the Tænia head, but a vesicular tail and body, which is so large as to envelope the head. The best example of this simple form of larval tapeworm is the Cysticercus cellulosa, found in man and the pig. There the parasite is seen of various shapes, either enveloped in its cyst, or with its cystic tail floating freely behind it, as when it occurs in the eye or ventricles of the brain.

The bodies to which the name of hydatids is commonly given belong to a different Tænia, the T. echinococcus. The cystic form of the worm is unfortunately only too frequently found in the human body, and may occur in almost any of its textures. The parasite itself is commonly called Echinococcus hominis, and is found surrounded by a thick, tough, sometimes semi-calcareous membrane, the so-called cyst-wall, which is separable from the surrounding tissues, but is formed by them or their connective tissue. Within this cyst there is found another and finer membrane, enclosing in many cases innumerable sacs, more or less spherical, the smaller almost as transparent as a soap-bubble, the larger more opaque. These in their turn contain other vesicles, and they, it may be, still others, the whole floating freely in the mother-sac or vesicle; or if very numerous, closely compressed together. These vesicles, if punctured, promptly collapse. Their shape is most commonly globular, and the Tænia head is retracted. If that be pushed out they are more elongated, and the hooklets and suckers are shown. The cavity in which they are contained is commonly unilocular, but may be multilocular.

The signs of hydatids depend entirely on the part containing them and the size of the tumour. In the brain or eye a small cyst may give rise to much trouble; in the liver, a common site, a large one may give comparatively little annoyance. The tumour when it can be felt has a soft, semi-elastic feel, and gives a peculiar thrill when percussed, but the diagnosis may usually be verified by means of the aspirator and a fine needle. This, however, will not be the case if the quantity of vesicles is great, and

their size large. The method of exclusion is valuable in forming a diagnosis.

Treatment.—The medicinal treatment of hydatids is as unsatisfactory as possible. They are commonly surrounded by a cyst, so dense, that we can hardly understand any remedy penetrating it. On the other hand, the frequency with which we find dead and contracted cysts shows that they may and do very frequently perish; and if by any means we can bring about their death, then recovery may be hoped for. Recently the plan of electrolysis has been tried in hydatids of the liver, and found to succeed. So also has simple puncture. Probably when we can withdraw the fluid, or a certain quantity of it, and bring the elasticity of the enclosing tissues to bear on the tumour, we shall succeed in procuring permanent relief. Unfortunately hydatid cysts are prone to suppuration. When they do suppurate they should be opened freely, completely evacuated, and washed out frequently thereafter with disinfectants. Carbolic acid and water, or permanganate of potass and water, are best adapted for this purpose.

FLUKE WORMS.

This name has been given to certain parasites, the type of which is the *Distoma*, most frequently found in the liver or bile passages. The history of these is not very well known, but all of them pass through various intermediate stages, of which *opalina* and *cercaria* are now recognised as examples. In the human subject the symptoms are not characteristic; they may possibly give rise to obstruction of one or more bile ducts, and so to jaundice. One parasite, probably belonging to this group, the Bilharzia hæmatobia, seems, however, of considerably greater importance. This animal and its ova are found in various parts of the body, but it seems to derive its importance almost entirely from the fact that it appears to be the immediate cause of that endemic hæmaturia which is so common at the Cape and Natal.

ROUND WORMS.

Best known among the round worms inhabiting the human body are the *Ascarides* (Ascarus lumbricoides). These worms are most frequently found in children. The

body is long, rounded, and pointed at either extremity. It is chiefly found in the intestines, but may penetrate thence into other parts communicating therewith, as the bile and pancreatic ducts, or even more curious localities. They are marked with transverse striæ, and are not bisexual. The males are not so numerous as the females. The mature female always contains an enormous number of ova. These ova are exceedingly tenacious of life, and will go on segmenting under the most untoward circumstances. The exact history of these parasites is not known.

The small threadworm of children (*oxyuris*) is sometimes a very troublesome parasite. As it resides mostly in the rectum, and neighbourhood of the anus, it may give rise to much irritation, and may escape thence into the vagina in female children. They may be suspected in children who are constantly picking or rubbing at these parts, and in such the worms may generally be detected in the motions.

The *treatment* of both these kinds of parasites is simple enough. If necessary, turpentine and castor-oil in small doses may be given. Usually a few doses of calomel suffices to get rid of the oxyurides. Santonin is generally looked upon as the best remedy for ascarides; the dose is from two to five grains, and should be followed by castor-oil. If given in repeated doses it affects vision, causing everything to look yellow. For oxyurides enemata of salt and water, or containing about a drachm of oil of turpentine with soap and water, are the best remedies.

A worm, the history of which is not well known, but the results of whose presence are serious in the extreme, is the *Trichina*. This parasite inhabits the muscles of man, and may give rise, prior to its encystation, to exceedingly severe symptoms. In its encysted form, in which it is best known, the worm lies coiled up in a transparent or cretified cyst, somewhat elongated rather than oval, probably from its position between the muscular fibres. More than one severe outbreak of trichiniasis has occurred abroad, and seems to be invariably connected with the consumption of meat in which the parasite or its ova are to be found. The illness commences with lassitude and depression, loss of appetite, and fever, very much indeed like the onset of typhoid or acute tuberculosis, but presently there is developed extreme pain in all the muscular parts of the body, with cramps and tenderness, especially on moving the limbs. Death frequently occurs in such cases, and then the whole muscular system is

found invaded by these worms, some in the active, some in the encysted state.

The parasite is bisexual, and produces its young alive in the intestines. Thence they make their way, partly by boring, partly by the blood-current, into all the muscular parts of the body, there to rest. The flesh of the animal containing these in the resting state, if eaten by another, is the medium of infection. Once introduced into the system, there seems as yet nothing to be done; all kinds of anthelmintic remedies have been tried, but failed; apparently the only hope is that the parasite may become encapsuled so as to remain at rest.

Belonging to this same group is another parasite, said to be found in the blood of individuals the subjects of that curious malady, chylous urine. In appearance it chiefly resembles the Trichina. Its history has not yet been made out.

The Guinea worm (Filaria medinensis, or Dracunculus) is another parasite, the stages of whose history are not yet known. In the state in which it inhabits the human being it resembles a long piece of whipcord. It is only found in the tropical regions of Asia and Africa. The number of worms inhabiting an individual varies much: as a rule, only one is found, but it is possible to find as many as fifty. The parasite is most frequently encountered in the foot, but it may appear in almost any part of the body. It is supposed to be introduced into the system with drinking-water, and to make its way from the intestines to the part where it makes its appearance, or more directly by invading the part.

The earlier symptoms of its existence in the part are pricking and itching; next a vesicle forms, which enlarges rapidly, and if not opened becomes turbid. When burst or opened, the extremity of the worm is seen as a protruding tube, whence its ova have been discharged, lying in the middle of the sore. This has to be seized with the greatest caution, and the worm gradually dragged out by wrapping round a piece of card. Fortunately its tissues are very tough, for if it breaks and its ova escape, great irritation and inflammation of the part are set up.

EPIZOA, OR SURFACE PARASITES.

The surface parasites of man are chiefly four—viz., three forms of louse, and the common flea. The three

forms of lice are the head louse, the body louse, and the crab louse. The body louse is sometimes exceedingly troublesome in old people, giving rise to excessive prurigo, and can be hardly got rid of. The reason is that their ova are commonly adherent to the inner clothing, and until these are destroyed by baking, any amount of change of clothing is useless. The best remedy is corrosive sublimate, or some mercurial ointment, applied after the skin has been well washed with soap and warm water. A solution of corrosive sublimate in alcohol, two grains to the ounce, should after the washing be applied, and perfectly clean and well-baked clothes put on. This process must be repeated if necessary. The same remedy will effectually remove the other forms of lice. Care must, however, be taken, if the surface is at all raw, not to apply the lotion to the sores themselves, or serious consequences may follow. A few applications usually suffice.

The itch *acarus*, which gives rise to the well-known skin disease, may be got rid of in a similar manner, but for it simpler measures usually prevail. As before, the surface is to be well washed with black soap and water, and the same lotion applied. Usually, however, sulphur ointment is employed; but a far preferable application is a lotion composed of lime ℥ss, sulphur ℥j, water ℥viij, boiled until a thoroughly homogeneous mixture has been obtained.

EPIPHYTES, OR VEGETABLE PARASITES.

The vegetable parasites which infect the human being all belong to the group of Fungi. These fungi are found in very many different forms of disease, but their exact value in the production of disease is not certain. Some hold that they are the cause of the disease, others that the diseased condition only affords them an appropriate *nidus*. We have already alluded to the belief that cholera may be dependent on the presence of a fungus somewhat similar to that found in spoiled rice, but this is very far from being proved. The chief maladies affecting man evidently of a fungoid nature are certain skin diseases.

Tinea Tonsurans, or *Ringworm*, is one of these, and of it there are certain varieties. This form of disease is due to the presence of a fungus (Trichophyton) in the interior of

the roots of the hairs. This fungus, as seen in the hair, consists almost entirely of spores, with a few mycelial threads. These gradually increase, thickening the hair, and causing it to break off short. The stump is still more speedily invaded, and the fungus begins to grow on the epithelium of the hair follicle, which, mixed with fatty granules, &c., gives rise to the crusts seen in the malady. It of course causes baldness in the part attacked. To cure this condition it is necessary to get rid of the fungus. To this end, all affected hairs and stumps, known by being covered with a peculiar whitish powder, the sporules of the fungus, must be removed. This is best done by an appropriate pair of forceps. This having been done, some application should be made so as to destroy the fungus which remains in the follicles. Various applications have been recommended—oil of cade, corrosive sublimate, pernitrate of mercury, &c.; but the best and simplest are sulphurous acid of the Pharmacopœia strength, or a tolerably strong solution of the sulphite of soda. Carbolic acid in the ordinary strength used for dressing wounds will also be found an excellent application.

Favus is another of these parasitic skin diseases. It is due to the presence of a fungus (Achorion Schönleinei) which affects the hair follicle or the epidermis. It forms yellow crusts, more or less cup-shaped and confluent. It is easily transmissible, but difficult of extirpation. The spores, mycelium, epidermis, and sometimes purulent matter, form the crusts which cover the ulcerated surfaces. To get rid of this troublesome malady the head must be shaved, or the hair cut close. The crusts must next be removed by poulticing, or by liquor potassæ and glycerine. All hairs in the affected parts should be removed, and tar-ointment, or carbolic acid in oil or water freely applied. Some recommend instead sulphate of copper. Sulphurous acid is a good application. Two or three forms of parasitic skin disease commonly described as Tinea decalvans, producing baldness in patches, are to be dealt with by like remedies, and so too is Tinea versicolor, producing the yellow or liver-coloured spots of chloasma.

One of the most formidable fungous affections yet known seems to be that known in India under the name of Fungus foot, or Madura foot. To it also the name Mycetoma has been applied. A fungus seems by some means or other to make its way beneath the skin of the

foot, probably as the result of some slight injury to the surface. Here it grows and flourishes, giving rise to truffle or fish-roe-like bodies, which utterly disorganize the parts, especially the bones, causing many fistulous openings, and necessitating the complete removal of the affected member. The fungus is commonly called, from its discoverer, Chyoniphe Carteri.

PART III.

THERAPEUTICS.

By *therapeutics* is meant the art of healing in all its departments, but it is most frequently confined to the treatment of disease by drugs, in contradistinction to what is sometimes called the *hygienic* and *dietetic* management of disease. The word is also used to imply the specific effects of certain drugs on the diseased rather than the healthy organism; and so to constitute one portion of the study of the Materia Medica. To classify drugs according to their properties and uses is a task of extreme difficulty, but as such a classification, however rude, is of real service to him who has to encounter disease practically, it has been adopted here, though confessedly in a most imperfect manner. Moreover, there is here no pretence at describing and discussing every agent, remedy, or medicinal preparation contained in the Pharmacopœia, but only those commonly acknowledged to be the most important.

I. ANTACIDS, OR ALKALIES.

By antacid remedies are meant such drugs as directly combine with free acids to form neutral compounds. They consist mainly of the alkalies, some of the alkaline earths, and their carbonates. They are chiefly used to neutralize free acids, or acid salts, in the stomach or bowels, to render the urine alkaline, to relieve skin eruptions, and in rheumatic fever.

POTASH.—*Antacid Preparations:* Potassa Caustica (for external use only), Liquor Potassæ (dose 15 to 60 minims), Potassæ Carbonas (seldom used internally), Potassæ Bicarbonas (dose 10 to 60 grs.), Potassæ Acetas (dose 10 to 60 grs.), Potassæ Citras (dose 20 to 60 grs.).

Potassa Caustica, or *Caustic Potash*, either by itself or along with lime, is used in the solid form to open abscesses such as buboes, to destroy the edges of indolent ulcers, to remove warty growths, and to form issues. As it is very deliquescent, care must be taken to prevent it from spreading, and as soon as the desired effect is accomplished, it should be neutralized by vinegar, or acetic acid and water.

Liquor Potassæ (solution of caustic potash) is used internally in many cases of dyspepsia arising from gastric catarrh. It should be given in a vegetable bitter some time before food.

Potassæ Carbonas, or *Carbonate of Potash*, is mainly used externally. A lotion containing from 30 to 60 grains to the pint of water is much used in the treatment of eczema, prurigo, and some other forms of skin disease. The same lotion is useful in removing gouty concretions.

Potassæ Bicarbonas, or *Bicarbonate of Potash*, is used internally and externally. It is given in large doses (20-60 grs.) in acute gout and rheumatism, and in other cases where it is desired to render the urine speedily alkaline.

Potassæ Acetas, or *Acetate of Potash*, is in the system converted into carbonate of potash, and then eliminated in the urine. It is mainly given as a diuretic, or to render the urine alkaline. It is seldom given alone.

Potassæ Citras, or *Citrate of Potash*, is a neutral salt also converted within the system into the carbonate, which is alkaline. It can be long given without disordering the stomach, and is especially useful where there is a

tendency to uric acid formation. It is best given effervescing, as bicarbonate of potash and citric acid. It is supposed to be diuretic.

SODA.—*Alkaline Preparations:* Soda Caustica, Liquor Sodæ, Sodæ Carbonas (dose 5 to 20 grains), Sodæ Bicarbonas (10 to 60 grains or more), Sapo.

The preparations of soda are much less frequently employed internally than those of potash, if we except the Bicarbonate, which is largely prescribed as an alkali or antacid. A solution of the Carbonate of about 20 grains to the pint of water is useful in some forms of uterine discharge, where applied as an injection.

Sapo (*Hard Soap*) is used as an adjunct to various liniments where rubbing is necessary, and in solution is frequently given by itself, or in conjunction with other remedies, as a laxative enema.

LITHIA.—The preparations of Lithia are Lithiæ Carbonas (dose 3 to 6 grains), with a Liquor Effervescens which may be used almost ad libitum, and Lithiæ Citras (dose 5 to 10 grains).

Lithia is hardly used except as a remedy for gout. In this malady it is chiefly prescribed on the ground of its compound with uric acid being more soluble than the corresponding potash salt.

AMMONIA.—*Alkaline Preparations:* Liquor Ammoniæ (rarely used internally), Ammoniæ Carbonas (dose 3 to 10 grains), with Spiritus Ammoniæ Aromaticus (dose ½ to 1 drachm).

Ammonia, though an alkali, is seldom used for its alkaline properties, but rather for its stimulant effects. Locally, however, it is used as Liquor Ammoniæ for the stings of bees and wasps, and the bites of insects whose virulence depends on the presence of formic acid. Sometimes the carbonate is given internally, to act both as a stimulant and antacid, as in flatulent dyspepsia and colic, depending on fermentation of the food.

MAGNESIA.—*Alkaline Preparations:* Magnesia (dose 10 to 60 grains), Magnesia levis (dose 10 to 60 grains), Magnesiæ Carbonas (dose 10 to 60 grains), Liquor Magnesiæ (dose 1 to 2 fluid ounces, chiefly as a purgative), Magnesiæ Carbonas levis (dose 10 to 60 grains).

Magnesia is of great value as an antacid, especially in poisoning by the strong mineral acids; but the carbonates set free much carbonic-acid gas, hence magnesia itself is better. The compounds so formed are mainly purgative. They are sometimes used as antacids, but are only palliative.

CALX (LIME).—*Antacid Preparations:* Liquor Calcis (dose 1 to 4 fluid ounces), Liquor Calcis Saccharatus (dose 15 to 60 minims), Creta Præparata (dose 10 to 60 grains), with Mistura Cretæ (dose 1 to 2 fluid ounces).

Liquor Calcis, or *Lime-water*, is sometimes used as an antacid. With this view it may be added to the milk used as a child's food, or given in diarrhœa due to change in the milk after swallowing. Unlike magnesia, it tends to act as an astringent. Lime-water is also very useful in some forms of vomiting. Externally lime-water is sometimes used in eczema, and mixed with oil it is a valuable remedy in burns. It is also useful in some forms of leucorrhœa as an injection. Chalk may be used in poisoning with the stronger acids. It is best in oxalic-acid poisoning. Chalk may be applied as a dusting powder to weeping and irritated surfaces with good effect. The Mistura Cretæ is mainly used as an astringent.

II. ANTHELMINTICS.

Anthelmintics constitute a well defined group of remedies, useful for the destruction of internal parasites. It seems, however, essential that they be brought in immediate contact with the parasite, and hence no remedy of the class seems of any great service in the case of those parasites which have left the alimentary tract and become encysted as Hydatids, Trichinæ, and Cysticerci.

FILIX MAS.—*Preparation*: Extractum Liquidum (dose 15 to 30 minims or more).

Foremost among anthelmintics comes Filix Mas, or *Male Fern*, whose rhizome, when treated with ether, yields the liquid extract above referred to. It is used for tapeworm only. The remedy is to be given the first thing in the morning, and to be followed, in about a couple of hours, with a dose of castor-oil. No food is to be

taken in the meantime. Usually the tapeworm is killed and the head expelled, but this must be satisfactorily established before we can say there is no risk of return.

CUSSO or Kousso is another remedy for tapeworm, mainly used in Abyssinia, where the plant whose flowers constitute Kousso is indigenous. In this country it is not much used, from a suspicion that the remedy is often adulterated, and from its price. Half an ounce or an ounce of the flowers should be infused in water and swallowed, grounds and all, the first thing in the morning. This should be followed by half an ounce of castor-oil.

OLEUM TEREBINTHINÆ (dose ½ to 1 fluid ounce).—*Oil of Turpentine* is of great service as an anthelmintic both against tapeworms and round worms. Unfortunately it is nauseous, and often cannot be taken. It is usual to combine it with half an ounce of castor-oil. The combination is usually successful in causing the death and ejection of the worm or worms.

KAMALA (dose 30 grains to 3 drachms).—*Kamela*, which is a powder obtained from the capsules of the Rottlera tinctoria, is extensively used in India for tapeworm, but is not yet much employed here. It requires no purgative.

GRANATI RADICIS CORTEX.—*Preparation:* Decoctum (dose 1 to 2 fluid ounces).

The bark of the root of the pomegranate tree, when fresh, possesses considerable power as an anthelmintic, but the dried bark seems almost inert.

SANTONICA (Worm seed; dose 10 to 60 grains).—*Preparation:* Santoninum (dose 2 to 6 grains).

Santonin is the active principle of Santonica, and is alone used. It is the best remedy we possess against small round worms. Like other anthelmintics, it should be given fasting, and a dose of castor-oil subsequently administered. To children it is conveniently given in gingerbread. After taking it, patients sometimes see objects yellow.

Besides these strictly anthelmintic remedies, others, like compound scammony powder, are frequently administered,

especially for threadworms. For small threadworms enemata of salt-and-water, infusion of quassia, perchloride of iron, tar water, or lime-water will often suffice.

III. ANTISPASMODICS.

The term Antispasmodic is given to a fairly well-marked group of remedies, chiefly useful in certain forms of nervous disorder. Its main constituents are Assafœtida, Galbanum, Ammoniacum, and Valerian, all distinguished by a powerful and somewhat disagreeable odour, due to certain volatile substances on which mainly their efficacy depends. The group is a strictly provisional one.

ASSAFŒTIDA (dose 5 to 30 grains).—*Preparations:* Enema Assafœtidæ Pilula Aloes et Assafœtidæ (Socotrine Aloes, Hard Soap, Assafœtida, Confection of Roses; dose 5 to 15 grains), Pilula Assafœtidæ Composita (Assafœtida, Galbanum, Myrrh, Treacle; dose 5 to 15 grains), Spiritus Ammoniæ Fœtidus (Assafœtida, strong Solution of Ammonia, Spirit; dose ½ to 1 fluid drachm), Tinctura Assafœtidæ) dose ½ to 1 fluid drachm).

Assafœtida is a gum resin; it has a warm taste and a very disagreeable smell. It produces a sensation of heat in the stomach, and helps greatly to relieve flatulence. It communicates its odour to the secretions for some time after its use. It is of great value in hysteria, and in flatulent dyspepsia, especially in women and children. It is best given in the form of pill.

GALBANUM is closely allied to Assafœtida, but seems less active. It is seldom prescribed by itself, but along with assafœtida in the compound assafœtida pill.

AMMONIACUM (dose 10 to 20 grains).—Mistura Ammoniaci (Ammoniacum, Water; dose ½ to 1 fluid ounce).

Ammoniacum, though partaking of the characters of Assafœtida and Galbanum, seems more distinctly stimulant, and less antispasmodic. It is almost exclusively used in the chronic bronchitis of old people, in which it is invaluable. The mistura is chiefly ordered.

VALERIANÆ RADIX. — *Preparations:* Infusum (dose 1 to 2 fluid ounces), Tinctura (dose 1 to 2 fluid drachms), Tinctura Valerianæ Ammoniata (Valerian, Aromatic Spirit of Ammonia; dose ½ to 1 fluid drachm), Zinci

Valerianas (dose 1 to 3 grains), Sodæ Valerianas (dose 1 to 5 grains).

Valerian is made use of in two forms—as preparations of the officinal root, of which the Ammoniated Tincture is the most important; and, again, preparations of Valerianic acid, not derived ordinarily from the plant, but from fusel oil. Many prefer the officinal preparations with oxide, or sulphate of zinc to the valerianates. The remedy acts as a stimulant from the oil it contains, but has also special properties exceedingly useful, particularly in hysteria and allied disorders. It sometimes does good in neuralgia, and has been strongly recommended in some forms of diabetes insipidus.

IV. ASTRINGENTS.

Astringents are remedies which, being applied directly or indirectly to a secreting surface, tend to diminish the discharge therefrom, partly by causing contraction of the vessels of the organ, but partly also by a direct influence on the tissues. The great majority of vegetable astringents contain, and depend for their influence on, tannic or gallic acids.

ACIDUM SULPHURICUM.—*Preparations:* Acidum Sulphuricum Dilutum (dose 5 to 30 minims), Acidum Sulphuricum Aromaticum (dose 5 to 30 minims).

All the stronger mineral acids, including Nitric Acid, Sulphuric Acid, Hydrochloric Acid, Phosphoric Acid, and, in smaller degree, Acetic Acid, act as astringents; but Sulphuric Acid acts the most powerfully in this way. They are given internally only in the dilute form. Used concentrated, and applied directly to the skin, they destroy the tissues, absorbing the elements of water. Nitric Acid is mainly used this way, but Sulphuric Acid may be used for the destruction of morbid growths. Applied in the more dilute form, these acids act as astringent lotions, and thus may be used for the destruction and removal of warts, and condylomata. The same kind of lotion in less degree of strength is often useful in urticaria, for relieving itching. Profuse perspiration can be checked by sponging the surface with them in very weak solution. Similar or stronger solutions are useful as washes to indolent ulcers. The mineral acids, especially hydrochloric acid, are given to aid digestion, and in diarrhœa, when sulphuric acid with opium is often found of great service. Sul-

phuric Acid, together with Gallic Acid, is also of great service in internal hæmorrhage, especially from the stomach and bowels, and it is sometimes given to arrest profuse perspiration, as in the latter stages of phthisis. The addition of Sulphuric acid to Epsom salts (Sulphate of Magnesia), or to Sulphate of Soda used as purgatives, not only renders the medicine more palatable, but seems to increase its efficacy.

ALUMEN (dose 10 to 20 grains).—*Preparation:* Alumen exsiccatum (not used internally).

Alum, or the *Sulphate of Aluminum*, acts mainly as an astringent. Alumen exsiccatum, or dried alum, is a weak escharotic. Applied to raw or weeping surfaces, alum diminishes discharge, and it is useful for arresting the slighter varieties of hæmorrhage. Alum in moderately strong solution is useful in discharges from the vagina and vulva, and in purulent ophthalmia. Again, it may be used with great advantage in inflammation of the mouth and throat, especially of the chronic variety. Internally alum is most frequently given for diarrhœa, and at one time it had a great reputation in hooping-cough.

BELÆ FRUCTUS.—*Preparation:* Extractum Liquidum (dose 1 to 2 fluid drachms).

Bael has no great reputation in this country, but in India, where it can be obtained fresh, it is often used with advantage in the treatment of dysenteric diarrhœa.

CATECHU PALLIDUM (dose 10 to 30 grains).—*Preparations:* Pulvis Compositas (Catechu, Kino, Rhatany, Cinnamon, and Nutmeg; dose 20 to 40 grains), Infusum (dose 1 to 2 fluid ounces), Tinctura (Catechu and Cinnamon; dose ½ to 2 fluid drachms), Trochisci (1 to 6 lozenges).

Pale Catechu is the extract got from the leaves and twigs of Uncaria Gambir, and is a powerful astringent. Its astringency is mainly due to a variety of tannic acid which it contains, partly also to another substance, catechin. It is mainly used as Pulvis Compositus, and as Tincture for diarrhœa. The lozenges are good in relaxed sore-throat.

CREASOTUM (dose 1 to 3 minims).—*Preparations:* Mistura (Creasote, Glacial Acetic Acid, Spirit of Juniper,

Syrup and Water; dose 1 to 2 fluid drachms), Unguentum, and Vapor.

Creasote is one of the products obtained in the destructive destillation of wood. It is mainly of use from its power of arresting fermentation, and hence it may be employed with advantage in fermentative dyspepsia, and the flatulence and diarrhœa therefrom arising. It also serves to arrest hæmorrhages. It is closely allied to carbolic acid. The vapour or inhalation is very useful in bronchial dilatation with fœtid expectoration. Locally its ointment is of much service in psoriasis and eczema, especially if at all chronic.

CRETA PRÆPARATA (dose 20 to 40 grains).—*Preparations:* Mistura Cretæ (Chalk, Gum Acacia, Syrup, and Cinnamon Water; dose 1 to 2 fluid ounces), Pulvis Cretæ Aromaticus (Chalk, Cinnamon, Nutmeg, Saffron, Cloves, Cardamoms, and Sugar; dose 20 to 60 grains), Pulvis Cretæ Aromaticus c. Opio (Aromatic powder of chalk and opium; the dose depends on the opium, which is *one* grain in *forty* of the powder).

Chalk, whether as prepared chalk or precipitated carbonate of lime, acts, when given internally, both as an antacid and as an astringent. Hence it is mainly used in diarrhœa. It is also used externally as a drying powder for children suffering from chafed buttocks, and sometimes in eczema.

CUPRI SULPHAS (dose internally as astringent, ¼ to 2 grains; emetic, 5 to 10 grains).

Sulphate of Copper, obtained by the oxidation of copper pyrites, given internally in small doses, acts as an astringent, sometimes used in cases of obstinate diarrhœa, and in dysentery. It is only used as an emetic in narcotic poisoning. Externally it is used in solution of 1 or 2 grains to the ounce as a stimulant and astringent to certain forms of ulcers. The solid crystals may be used to arrest bleeding, or to destroy fungous granulations, and applied to sores of the tongue.

ERGOTA (*Preparation:* Extractum Ergotæ Liquidum; dose 10 to 60 minims). Ergot can hardly be described as an astringent, but as a special stimulant to the smaller blood-vessels it has been found of great service in some forms of hæmorrhage, especially from the lung and from the uterus.

FERRUM.—The most important astringent Salts of Iron are the Sulphate (dose 1 to 3 grains), the Liquor Ferri Perchloridi (dose 10 to 30 minims or more), Tinctura Ferri Perchloridi (dose 10 to 20 minims or more), and the Liquor Ferri Pernitratis (dose 10 to 30 minims or more).

Iron as an astringent is most frequently used in one or other of these forms, and is employed both externally and internally. These salts are valuable for arresting hæmorrhage externally and from the stomach and bowels, and also in diarrhœa. They may also be used in gonorrhœa and gleet.

GALLA.—*Preparations:* Tinctura (dose ½ to 2 fluid drachms), Unguentum, and Unguentum Gallæ c. Opio.

Galls are mainly of service from the tannic and gallic acids they contain, and have been to a great extent superseded by these, save that the ointment of galls and opium is very useful in piles.

TANNIC and GALLIC ACIDS are both largely used, the former more frequently externally, especially as Glycerinum. There is also a Glycerine of Gallic Acid, and a Suppository and Lozenge of Tannic Acid.

The Glycerines of these acids are very useful in chronic nasal discharges, and in those of chronic otorrhœa. Again, they are useful in the raw and weeping stage of eczema, and in many throat affections. They may also be used in chronic urethral and vaginal discharges, for which the acids are also sometimes used as Lotion. Gallic Acid and Sulphuric Acid mixed are often of great service in hæmoptysis, and hæmatemesis.

HÆMATOXYLI LIGNUM.—*Preparations:* Decoctum (Logwood and cinnamon; dose 1 to 2 fluid ounces), Extractum (dose 10 to 30 grains).

Logwood is not very much used as an astringent, and when so, almost exclusively for diarrhœa and dysentery. The Extract being sweetish, is useful for children. If the urine be alkaline, it is stained red by the logwood.

KINO.—*Preparations:* Tinctura (dose ½ to 2 fluid drachms), Pulvis Kino Compositus (Kino, Opium, and Cinnamon), 1 grain of opium in 20 of the powder; hence dose 5 to 20 grains.

Kino is the hardened juice of certain species of Pterocarpus. It contains the same kind of Tannic Acid that

Catechu does, and also Catechin. It is therefore used much in the same way as Catechu; mainly as an astringent in diarrhœa, sometimes as a gargle.

KRAMERIÆ RADIX.—*Preparations:* Extractum (dose 5 to 20 grains), Infusum (dose 1 to 2 fluid ounces), Tinctura (dose ½ to 2 fluid drachms).

Rhatany is the dried root of K. triandra, dark-red in colour, and containing much Tannin. It is not, however, greatly used, save as a tooth-powder, but may be employed wherever Tannin is indicated.

MATICÆ FOLIA.—*Preparation:* Infusum (dose 1 to 2 fluid ounces).

Matico consists of the leaves of the Artanthe elongata, which are curiously marked on both surfaces. They contain some Tannic Acid, but seem to be of most use for arresting the hæmorrhage of leech-bites, when applied as powder. More doubtfully Matico has been given in the same way as Copaiba and Cubebs.

PLUMBUM.—Most preparations of lead are astringent, but especially so are the Acetate and Subacetate, the Carbonate, and the Oxide called Litharge. The most important of these are—

PLUMBI ACETAS (dose ¼ to 3 grains).—*Preparations:* Pilula Plumbi c. Opio (Acetate of Lead, Opium, and Confection of Roses: 1 grain of Opium in 8 grains pill; hence dose 4 to 8 grains); Suppositoria Plumbi Composita (Acetate of Lead, Opium, Benzoated Lard, White Wax, and Cacao Butter), Unguentum Plumbi Acetatis, Liquor Plumbi Subacetatis Dil. (Goulard Water), and Unguentum Plumbi Subacetatis Compositus. The preparations of the Subacetate are only used externally.

The *Acetate* and *Subacetate of Lead* act as astringents and sedatives. The Pil. Plumbi c. Opio is of the greatest use in many forms of diarrhœa and in dysentery, whilst the subacetate applied externally not only diminishes discharge, but lessens pain, the latter even when the skin is unbroken. Given too long, Lead acts injuriously, producing anæmia and painter's colic.

The *Carbonate* is even more dangerous than the Acetate, and is seldom used. *Litharge* is only used in ordinary adhesive plaster.

QUERCUS CORTEX. — *Preparation :* Decoctum Quercus (hardly used internally).

Oak Bark is valuable chiefly for the Tannin it contains. It forms, however, as a decoction, an admirable basis for astringent lotions and injections. More rarely it is used as a gargle for relaxed sore-throat.

ROSÆ GALLICÆ PETALA.—*Preparations :* Confectio Rosæ Gallicæ, Infusum Rosæ Acidum (Red Rose Petals, Dilute Sulphuric Acid and Water), Syrupus Rosæ Gallicæ.

The Confection of Red Roses is almost entirely used as a pill basis. The Acid infusion is useful as a vehicle for such remedies as Epsom Salts, &c., when a slight astringent effect is desired along with other properties.

SODÆ BIBORAS.— *Preparations :* Mel Boracis, Glycerinum Boracis.

Boræ is a slight alkali and a slight astringent, mainly used as Mel or Glycerinum to the aphthous sores in the mouths of children ; sometimes also in pruritus pudendi.

ZINCUM.—Most of the compounds of zinc are astringent. The most important in this respect are the Oxide, the Chloride, the Sulphate, the Carbonate, and Acetate. The Chloride and Sulphate are the most powerful, the former being even used as an escharotic. Its only preparation is the Liquor Zinci Chloridi. The Sulphate is given internally as a nervine tonic, locally as an astringent to wounds for discharges, and again as an emetic (dose 10 to 30 grains). The Acetate is sometimes used locally, the Carbonate but rarely so. Oxide of Zinc is used locally for drying chafed surfaces, and also as pill for epilepsy, &c.

V. CAUSTICS.

The medicinal agents included under the head of Caustics or Escharotics are not very numerous. They include the most important acids and alkalies in a state of concentration, and various other substances less active in their characters.

ACIDUM ACETICUM GLACIALE, or *Glacial Acetic Acid*, is mainly used for destroying growths of low vitality, as warts and corns.

ACIDUM SULPHURICUM and ACIDUM NITRICUM, strong *Sulphuric* and *Nitric Acids*, are often used for the destruction of new growths, or the surfaces of unhealthy ulcers, especially of a syphilitic nature; in a more dilute form, they suffice to get rid of warts and condylomata.

Of the alkalies, POTASSA and SODA CAUSTICA, *Caustic Potash* and *Soda*, are mainly used. Sometimes Potassa c. Calce—*i.e.*, Potash and Lime, a more manageable preparation—is used in the place of the former. They are employed to open abscesses where the patient dreads the knife, to destroy the edges of hard and indolent ulcers, to open buboes, and to make issues. They tend, however, to spread very rapidly, and hence their action should be arrested, as soon as the desired end is fulfilled, by washing the parts with weak acetic acid and water.

ARGENTI NITRAS, *Nitrate of Silver*, can hardly be called an escharotic save to very lowly growths; it is, however, used this way, as are *Sulphate of Copper* and *Sulphate of Zinc*.

ZINCI CHLORIDUM, *Chloride of Zinc*, is a very much more important body as far as this kind of effect is implied. It rapidly affects the tissues to which it is applied, converting them into a slough, but producing great pain. As, however, it tends to run, it usually requires to be mixed up with some solid substance, as starch. In such a form the paste has been found of great value for the destruction of growths of a malignant or semi-malignant kind, as rodent ulcer of the face. It has also proved of great service in destroying the remains of cancerous growths after the great bulk of them has been removed by the knife. This is especially true of the eyeball. *Arsenious Acid* and the *Butter of Antimony* have been used in the same way, but are more dangerous from risk of absorption.

VI. DIAPHORETICS OR SUDORIFICS.

Diaphoretics, or remedies which promote perspiration, are partly vegetable, partly mineral; but chief among them is HEAT, used internally as hot drink, and externally as hot air or water; hot air constitutes the Roman or Turkish bath, the other the ordinary warm bath.

Among medicinal sudorific agents are—

AMMONIÆ ACETATIS LIQUOR, *Solution of Acetate of Ammonia* (dose 2 to 6 fluid drachms).—This is very largely used as a diaphoretic, especially in fevers, whether justly or no is doubtful, but it usually constitutes one of the important ingredients of the so-called salines largely given under such circumstances.

ANTIMONIUM.—*Compounds:* Antimonium Sulphuratum (dose 1 to 5 grains), Antimonium Tartaratum (dose $\frac{1}{10}$ to 2 grains). *Preparations:* Vinum Antimoniale (dose 15 to 40 minims), Unguentum Antimonii Tartarati; Antimonii Oxidum, *prep.* Pulvis Antimonialis (Oxide of Antimony and Phosphate of Lime; dose 3 to 15 grains).

Of the various preparations of Antimony used as diaphoretics, the Tartarated Antimony, or *Tartar Emetic*, given in doses from $\frac{1}{10}$ to 2 grains, is the most important. Antimonial Wine contains 2 grains of Tartar Emetic in the ounce—a quantity likely to produce vomiting.

The *Oxide of Antimony*, especially in the form of Antimonial Powder, intended to replace the old James's Powder, is also used as a diaphoretic. The Sulphuretted Antimony, or Golden Sulphuret, is chiefly used as what is called an alterative in the Compound Calomel Pill.

IPECACUANHÆ PULVIS COMPOSITUS (dose 2 to 10 grains).

Compound Ipecacuan Powder (Ipecacuan, Opium, and Sulphate of Potash) contains 1 grain of opium in 10 of the powder. This is one of the best diaphoretics where opium is admissible. The other preparations of Ipecacuanha (especially Ipecacuan Wine) act in this way, but less powerfully, producing more of an expectorant and nauseant effect. Compound Ipecacuan Powder, commonly called Dover's Powder, is of much use in catarrhs of the air-passages.

Such substances as *Dulcamara*, *Guaiacum*, *Mezereon*, *Sarsaparilla*, and *Sassafras* have also the reputation of acting as diaphoretics, but are seldom used save for chronic rheumatism and certain skin diseases.

VII. DIURETICS.

Diuretics, or medicines which are supposed to promote the flow of urine, comprehend substances of very different groups. Thus some, like Cantharides, Juniper, and Turpentine, seem to act as direct stimulants to the kidneys; some, like the Acetate, Citrate, and Acid Tartrate of Potash, increase the solubility of effete substances in the system, and so favour their elimination; whilst Digitalis probably acts on the blood-vessels.

ÆTHERIS NITROSI SPIRITUS (dose ½ to 2 fluid drachms).

Spirit of Nitrous Ether, or *Sweet Spirit of Nitre*, is a complex product mainly used for its diuretic, refrigerant, and diaphoretic characters, not one of which, save the first, seems very marked. It is used in dropsies and fevers.

CANTHARIDES are hardly used legitimately as diuretics, but mainly as blistering agents. Given internally they tend to produce strangury and bloody urine.

DIGITALIS FOLIA (dose ½ to 2 grains).—*Preparations:* Infusum Digitalis (dose 2 to 4 fluid drachms), Tinctura (dose 10 to 30 minims).

Digitalis is undoubtedly a powerful diuretic under certain circumstances, but what these are it is not easy to say. Certainly it acts very beneficially in most kinds of dropsies, especially those dependent on heart disease. The infusion is the best preparation.

JUNIPERI OLEUM (dose 2 to 10 minims).—*Preparation:* Spiritus Juniperi (dose 30 minims to 1 fluid drachm). The Oil of Juniper is distilled from the unripe fruit. It acts as a stimulant on the kidneys, and is chiefly used in dropsies. It is usually given as Spirit, or as Hollands Gin, but may very well be used as inhalation.

POTASSA.—The Salts of Potash mainly used as diuretics are the *Citrate*, the *Acetate*, the *Acid Tartrate* (Cream of Tartar), and sometimes also the *Nitrate*. The most important is the Acetate (dose 10 to 60 grains). The Citrate acts less on the kidneys, but sits better on the stomach

(dose 20 to 60 grains). The Acid Tartrate is best given as a habitual drink, it not being very soluble. Its solution may be given as strong as it can be made, cold, with some sugar and lemon. The Nitrate is not very often used as a diuretic, but sometimes proves useful in dropsies, and should not therefore be forgotten. Dose 5 to 20 grains. It is poisonous in large doses.

SCILLA (dose 1 to 3 grains).—*Preparations:* Acetum Scillæ (dose 15 to 40 minims), Oxymel Scillæ (dose ½ to 1 fluid drachm), Pilula Scillæ Co. (Squill, Ginger, Ammoniacum, Hard soap, and Treacle; dose 5 to 10 grains), Syrupus Scillæ (dose 30 minims to 1 drachm), Tinctura Scillæ (dose 10 to 20 minims).

Squill consists of the sliced and dried bulb of the Urginea Scilla, or Sea Onion. It is mainly used as an expectorant, but has also undoubted diuretic effects. A good combination this way consists of Digitalis, Squills, and Blue Pill. In large doses it gives rise to vomiting and purging.

SCOPARII CACUMINA.—*Preparations:* Decoctum Scoparii (dose 1 to 3 fluid ounces), Succus Scoparii (1 to 2 fluid drachms).

Broom-tops constitute one of our most important diuretics in dropsy depending on heart disease. The decoction is seldom given alone, but is best exhibited along with Acetate or Acid Tartrate of Potash, and Spirits of Juniper, but even by itself is of undoubted value.

SODÆ ACETAS and SODÆ BIBORAS both possess some diuretic powers, but are hardly ever given for these, other diuretics being preferred.

TEREBINTHINÆ OLEUM (dose 10 to 30 minims).—*Preparations:* Confectio Terebinthinæ (Oil of Turpentine, Liquorice, and Honey; dose 60 to 120 grains), Enema Terebinthinæ (Oil of Turpentine and Starch), &c.

Oil of Turpentine is obtained from various species of pines as an oleo-resin, whence the oil is destilled as a colourless limpid fluid. It is used for many purposes, but not so frequently as a diuretic as might be. However, it has effects in this way closely allied to those of Juniper, and may be given along with that drug as an ad-

junct. Other forms of Turpentine there are, as *Canada Balsam*, and *Chian Turpentine*, still less frequently used in this way.

VIII. EMETICS.

Emetics are a well-defined group of remedies, capable of producing vomiting, and used for this purpose. Various mechanical acts or agents might be enumerated among these, as tickling the fauces, and drinking freely of lukewarm water, but those commonly used are much more powerful.

AMMONIÆ CARBONAS (dose 20 to 30 grains or more, given well diluted). The Carbonate of Ammonia is used for many purposes, but as an emetic its use is mainly confined to cases of narcotic poisoning, or again in cases of bronchitis with profuse secretion which the patient is unable to bring up. If not at hand in the pure state, ordinary smelling salts may be used.

ANTIMONIUM TARTARATUM (dose 1 to 3 grains). —*Preparations:* Vinum Antimoniale (2 grains of Tartar Emetic in each ounce).

Tartar Emetic is valuable as an emetic in a totally different set of cases from the above. The chief peculiarity of its action is the prostration it produces, together with free perspiration. When therefore it is judged advisable to give an emetic at the beginning of a fever, this is probably the best. It is also useful in inflammatory affections of the air-passages in the early stage, and again later to get rid of secretion, if the patient can stand the depression it produces.

CUPRI SULPHAS (dose 5 to 10 grains).

Sulphate of Copper is an active emetic when given in the above dose, but is too powerful for ordinary use. It is therefore most frequently given when it is desired to relieve the stomach speedily of some narcotic or sedative substance, and when the organ requires to be sharply stimulated.

IPECACUANHA (dose 15 to 30 grains).—*Preparation:* Vinum Ipecacuanhæ (dose 1 to 6 fluid drachms).

Ipecacuan is one of our most valuable emetics; less

depressing than Tartar Emetic, it still has well-marked characters of its own in the same way, which render it useful. Thus among children who cannot rid their chests of mucus, Ipecacuan Wine given in teaspoonful doses often gives relief; and in the same way it is often of value in hooping-cough. Again, when from any cause we desire to evacuate the contents of the stomach, say if anything has been too freely eaten, Ipecacuan is about the best remedy, especially if followed by copious draughts of warm water—itself no mean remedy.

SCILLA.—Though Squill has well-marked emetic properties when given in large doses, it can hardly be said to be used medicinally for these, but rather for its value as an expectorant and diuretic.

SINAPIS (dose one tablespoonful—more or less).

Mustard is of two kinds—the white and the black. They are yielded by the seeds of two species of Sinapis, powdered and mixed, and this powder yields an acrid, pungent oil. Mustard is one of the most valuable emetics we possess in case of narcotic poisoning, being always readily obtainable; but as the ordinary domestic mustard is seldom so strong as that used medicinally, a somewhat larger dose should be given, and be followed by plentiful draughts of lukewarm water. Ordinary table-salt will also serve in the same way if a handful is given. Mustard has many other uses, being a powerful stimulant if applied to the skin, and being also of value as a condiment.

ZINCI SULPHAS (dose 10 to 30 grains).

Sulphate of Zinc, besides being of use as a nervine tonic and as a stimulant, is valuable as an emetic of the stimulant kind; and perhaps the best emetic for ordinary use consists of a combination of Ipecacuan and Sulphate of Zinc—15 grains of Ipecacuan to 10 of Sulphate of Zinc. This will generally be found to promptly evacuate the contents of the stomach without inordinate sickness and retching.

IX. EMMENAGOGUES.

Emmenagogues are remedies supposed to act more or less directly on the uterus, and thereby to promote the menstrual flow. Few, however, do so directly, save ergot,

which is seldom given for the purpose. Saffron has a certain reputation this way, but at best that is small. Rue and Savin are also supposed to act on the womb, but are not very often given for this purpose in legitimate practice. Much more powerful are warm baths, or warmth otherwise applied to the parts concerned, but even this may be unavailing if there be any obstruction due to flexion of the uterus, or other obstacle in the uterus or vagina. If any such be present, it must be removed. The great majority of cases of amenorrhœa which we see, if not due to physiological causes, depend on general anæmia, and to remedy this, Iron is the best medicine, and the Mistura Ferri the best preparation. It is common to find more or less amenorrhœa in anæmic subjects, and to treat them with so-called emmenagogues would be absurd. However, as the bowels are generally confined, it is often useful to combine with the Iron a certain proportion of Aloes. Hence the Compound Decoction of Aloes, or the Pill of Aloes and Myrrh, or the Pill of Aloes and Assafœtida, or the Pill of Aloes and Iron, or even the simple Extract of Aloes, will be found better than so-called emmenagogues. It should never be forgotten that amenorrhœa may be due to pregnancy—a circumstance to be carefully borne in mind in prescribing. Not that Iron or even Aloes is such a dangerous remedy in pregnancy, for many poor women who have again and again become pregnant without menstruating, absolutely require Iron during their pregnancy.

X. EMOLLIENTS AND NUTRIENTS.

Under the head of Emollients and Nutrients may be ranged a complex group of substances, some used externally, some internally; many of them constituting what might be called Ptisanes, or Drenches. Others, again, are used externally, as the bases of ointments, as poultices, &c.

ACACIÆ GUMMI.—*Preparation:* Mucilago.

Gum Acacia is the hardened exudation from a variety of species of Acacia, largely supplemented in this country by Cherry Gum. It is sometimes spoken of as a pure demulcent; when swallowed slowly, it has been supposed to relieve irritation of the throat, but it has

little effect this way. It is mainly used in the form of mucilage to suspend heavy powders insoluble in water, but for this purpose perhaps Tragacanth suits better.

TRAGACANTHA.—*Preparations:* Mucilago, Pulvis Tragacanthæ Co. (Tragacanth, Acacia, Starch, Sugar; dose ad libitum).

Tragacanth is the hardened juice of a species of Astragalus. It is only used to suspend heavy, insoluble powders, as Bismuth, &c.

GLYCYRRHIZA.—*Preparation:* Extractum Glycyrrhizæ (dose 10 to 30 grains).

Liquorice root is used mainly in the form of Extract, which is sucked slowly, for cough, or irritation of the throat, and also for its sweetness to cover the taste of more powerful remedies, as in Decoction of Aloes and Confection of Senna.

LINI SEMINA.—*Preparation:* Infusum Lini (Linseed, Fresh Liquorice, Water; dose ad lib.).

Linseed is used in various ways. In the infusion the seeds are employed whole for their mucilage, and it is used as a demulcent. Crushed the seeds constitute FARINA LINI, *Linseed Meal*, largely used for poultices (Cataplasma Lini). The Oil expressed from the seeds (OLEUM LINI) is also used externally for burns and scalds.

OLIVÆ OLEUM is used in various liniments. It yields by treatment with Caustic Potash *Sapo Mollis*, and with Caustic Soda *Sapo Durus*, in the process liberating *Glycerine*.

Sapo Durus, or *Hard Soap* (Castille Soap).—*Preparations:* Emplastrum Cerati Saponis, Emplastrum Saponis, Linimentum Saponis, commonly called Opodeldoc.

Sapo Mollis is used as a basis for pills, especially Pilula Saponis Composita or Opium Pill (dose 5 grains).

Glycerinum.—*Preparations:* Glycerinum Acidi Carbolici, G. Acidi Gallici, G. Acidi Tannici, G. Amyli or Glycerine of Starch, G. Boracis.

Olive Oil is sometimes used internally when cod-liver oil cannot be taken, then the purest to be obtained must be used. It is slightly laxative.

Soap is mainly used as a basis for pills, or is added to liniments to make them "rub." It is also often given as a simple soap and water enema.

Glycerine is of great value for its solvent powers, and softening effects on the skin. The various *Glycerina* are to be used according to their other constituents, save that of starch, which may be used as an ointment.

ADEPS.—*Preparations:* Adeps Benzoatus, Unguentum Simplex.

Lard or *Axunge* is prepared from the internal fat of the pig. When benzoin is added to it, it keeps better; and this is used as the basis of many ointments. Simple ointment is used to keep the skin moist, and so is sometimes laid on the surfaces of poultices.

SEVUM PRÆPARATUM.—Prepared suet is used in a similar fashion to lard.

CETACEUM.—*Preparation:* Unguentum Cetacei.

Spermaceti is obtained from the spermaceti whale. Its ointment is harder than that of lard.

CERA (flava and alba).—Preparation of C. alba, Ung. Simplex.

Bees' Wax, purified and bleached, is used to harden ointments. They formerly constituted a special class called *cerates*, but the name is not now used.

AMYGDALA AMARA and AMYGDALA DULCIS both yield Amygdalæ Oleum.

Sweet Almonds are used in the preparation of Mistura Amygdalæ and Pulvis Amygdalæ Co. They are nutritive and sweet flavoured, and may be made to suspend other and heavier remedies.

Bitter Almonds yield hydrocyanic acid and should not be used.

Almond Oil is demulcent, in larger doses laxative, and is used in many ointments. Almond biscuits are sometimes used in diabetes.

AMYLUM.—*Starch* should be obtained from wheaten flour (TRITICI FARINA), but is yielded by many other substances. Its preparations are Glycerinum Amyli and

Mucilago Amyli, ordinary liquid starch. Flour made into bread is often used as a basis for pills (MICA PANIS), or is used as a poultice when softened with water. Mucilage of starch is often used as the basis of opiate and such like enemata.

HORDEUM DECORTICATUM or Pearl Barley is used in the form of Decoctum Hordei or Barley water as a demulcent drink.

FICUS.—*Dried figs* are used in Confectio Sennæ. They as well as—

PRUNUM (*prunes*) or dried plums have the reputation of being slightly laxative.

UVÆ (*rasins*) are employed for sweetening purposes only, as is SACCHARUM or sugar.

MORRHUÆ OLEUM (dose 1 drachm to 1 ounce).

Cod-liver Oil, though commonly reckoned a medicine, is really a very easily digested kind of food. Hence it is useful where the powers of digesting fats are low, especially in phthisis and scrofula. It is often of the greatest service in chronic rheumatism and in tertiary syphilis. It is best taken after food, sometimes just before going to bed.

Many other substances might be enumerated in this class which can hardly be called of importance, but these will suffice.

XI. EPISPASTICS, OR COUNTER-IRRITANTS.

Epispastics or blistering agents are sometimes of the greatest value. Among them should be included all agents employed for counter-irritation, though the former term is more limited in signification. Foremost among these is heat applied in some intensity, as by the actual cautery, by the moxa—now never used—and by very hot water. Closely allied to these in respect of their results are setons, where a portion of thread or cord or india-rubber is introduced beneath the skin and kept there, being pulled backwards and forwards from time to time; and issues, where the cutaneous surface is destroyed so as to produce a raw sore by some strong acid or by caustic potash or soda. Neither practice is now in favour.

The most important agents employed in counter-irritation are these—

ANTIMONIUM TARTARATUM. — *Preparation:* Unguentum Antimonii Tartarati (one part of Tartar Emetic in five of the Ointment).

Tartar Emetic when applied to the skin gives rise to an eruption much resembling that of small-pox; but the pustules rise irregularly, and hence its action is uncertain; moreover, there is risk of absorption—hence it is seldom thus used.

CANTHARIS.—*Preparations:* Acetum Cantharidis, Charta Epispastica, Emplastrum Cantharidis, Emplastrum Calefaciens, Liquor Epispasticus, Unguentum Cantharidis.

Cantharides, the so-called *Spanish Flies*, are perhaps the most frequently used of all kinds of counter-irritants in one or other of the various forms above mentioned, the Emplastrum being the chief. The Charta Epispastica and the Liquor Epispasticus are, however, superior preparations in every way. By due care they can be made to give rise to any degree of local action, from simple reddening to vesication. If rubefaction alone is required, and that over a continuous period, the Acetum Cantharidis reduced by some weaker liniment may be used. Blisters are mostly employed for acute inflammations near the surface, sometimes for rheumatic pains in the joints, and sometimes to affect the growth of the hair, over which Cantharides seem to have a powerful influence. If any of the preparations become absorbed signs of renal and vesical irritation with strangury may ensue.

CROTONIS OLEUM.—*Preparation:* Linimentum Crotonis.

Croton Oil is the oil expressed from the seeds of the Croton Tiglium, and is an extremely acrid, irritating substance, whether exhibited internally or externally. Outwardly Croton Oil gives rise to too much pain where used by itself, causing a copious crop of small pustules. Hence it is commonly diluted, sometimes with Oil of Turpentine, with Olive Oil, or Soap Liniment. In this way any degree of counter-irritation may be produced, from faint reddening to a fine crop of small pustules. It is chiefly used in chronic chest affections.

SABINÆ CACUMINA.—*Preparations:* Tinctura Sabinæ and Ungentum Sabinæ (Savin, Wax, and Lard).

Savin Tops, which, when distilled, yield OLEUM SABINÆ, are powerful irritants, whether used externally or internally. Internally Savin is supposed to act specially on the uterus, and hence is spoken of as an emmenagogue, but it is also used as an abortant in dangerous doses; hence should never be given if pregnancy be suspected. Externally the Savin Ointment is only used as an application to open sores to keep them from healing, a practice now falling out of use.

SINAPIS and OLEUM SINAPIS.—*Preparations:* Cataplasma Sinapis, Linimentum Sinapis Compositum (Oil of Mustard, Ethereal Extract of Mezereon, Camphor, Castor Oil, Rectified Spirit).

Mustard is one of our most valuable counter-irritants. The Cataplasm, or Mustard Poultice, is mainly used for the purpose of reddening the skin over or near some inflamed or painful organ. The *Oil of Mustard* may be used in the same way if diluted with spirit, dropped on flannel, and covered with a hot poultice. Often mustard itself is added to hot foot or hip-baths.

TEREBINTHINÆ OLEUM.—*Preparations:* Linimentum Terebinthinæ, Linimentum Terebinthinæ Aceticum, Unguentum Terebinthinæ.

Oil of Turpentine is a powerful rubefacient, and may even vesicate. It is best applied as "Turpentine Stupe." Hot flannels are wrung out of water as hot as the hands will bear; on these Oil of Turpentine is sprinkled, and applied to inflamed or painful organs, particularly the abdomen. It is frequently added to other counter-irritants.

XII. EXPECTORANTS.

Expectorants are remedies which aid the evacuation of the secretions of the bronchial tubes. They are of two very distinct classes, some being sedative, some stimulant, and hence to be used under very different circumstances.

AMMONIÆ CARBONAS (dose 3 to 10 grains).—*Preparations:* Spiritus Ammoniæ Aromaticus (Carbonate of

Ammonia, strong Solution of Ammonia, Oil of Nutmeg, Oil of Lemon, Spirit, and Water; dose ½ to 2 fluid drachms).

The *Carbonate of Ammonia*, though hardly an expectorant, is so often used in expectorant mixtures for debilitated subjects as to fairly well deserve the name. It is well given along with Senega and Squills.

AMMONIACUM (dose 10 to 30 grains).—*Preparation:* Mistura Ammoniaci (dose ½ to 1 fluid ounce).

Ammoniacum is a gum resin, acting as a powerful stimulant expectorant, especially useful in the chronic bronchitis of old people, when it may be combined with Squill, Senega, and Ammonia. It is not suitable for acute cases.

ANTIMONIUM TARTARATUM (dose $\frac{1}{10}$ to ¼ grain).—*Preparation:* Vinum Antimoniale (dose 15 to 30 minims).

Tartar Emetic is often of service as a sedative expectorant in severe bronchitis in its acute stage, and even in pneumonia. It is not so often used nowadays as it had wont to be. It should only be used in the acute stage.

BALSAMUM PERUVIANUM (dose 10 to 30 minims). BALSAMUM TOLUTANUM (dose 10 to 30 grains).—*Preparations:* Syrupus Tolutanus (dose 1 to 3 fluid drachms), Tinctura Tolutana (dose ½ to 1 fluid drachm).

The *Balsams of Peru and Tolu* are both obtained from species of Myrospermum, and are so closely allied as to be said to be identical in effect, only Peruvian Balsam is dark and fluid, that of Tolu harder and lighter. Both are stimulants, internally and externally, and both are useful in the chronic bronchitis of old people. Externally both are often used with advantage as applications to bed-sores and unhealthy ulcers of a chronic kind.

BENZOINUM (dose 10 to 30 grains).—*Preparations:* Tinctura Benzoini Composita, or Friar's Balsam (Benzoin, Storax, Balsam of Tolu, Socotrine Aloes, Spirit; dose ½ to 1 drachm).

Acidum Benzoicum (dose 10 to 15 grains), Ammoniæ Benzoas (dose 10 to 20 grains).

Benzoin, or Gum Benjamin, is the hardened juice of a

species of Storax; *Benzoic Acid* is the acid derived therefrom by sublimation. Both are stimulants, but Benzoin is seldom used nowadays internally; formerly it was used in chronic bronchitis. More frequently as tincture it is applied to wounds. Benzoic Acid, or Benzoate of Ammonia, which is more soluble, is used as a kind of diuretic, especially when the urine is phosphatic. The aromatic effects of the acid are of notable service when the urine has become alkalescent, as in catarrh of that organ.

IPECACUANHA (dose ½ to 2 grains).—*Preparations:* Pilula Ipecacuanhæ c. Scilla (Compound Powder of Ipecacuan, Squill, Ammoniacum, and Treacle; dose 5 to 10 grains), Vinum Ipecacuanhæ (dose 5 to 40 minims).

Ipecacuan as an expectorant is of exceeding great value, acting in the same way as Antimony, but less depressing. It is mainly of use in the earlier stages of bronchitis. In the bronchitis of children, as well as in inflammatory affections of the higher air-passages, its use as an emetic is often of great value, clearing the air-tubes and promoting subsequent secretion of a less viscid kind than before. Vinum Ipecacuanhæ is here its best form.

SCILLA (dose 1 to 3 grains).—*Preparations:* Acetum Scillæ (dose 15 to 40 minims); Oxymel Scillæ, dose ½ to 1 fluid drachm), Pilula Scillæ Composita (Squill, Ginger, Ammoniacum, Hard Soap, and Treacle; dose 5 to 10 grains), Syrupus Scillæ (dose ½ to 1 fluid drachm), Tinctura Scillæ (dose 10 to 20 minims).

Squill is a valuable stimulant expectorant, intermediate in qualities between Ipecacuan and the balsams and gum resins. It is therefore commonly given in subacute or chronic cases, and often is combined with Ipecacuan and small doses of Compound Tincture of Camphor, or Ammoniated Tincture of Opium.

SENEGÆ RADIX (dose 20 to 60 grains).—*Preparations:* Infusum Senegæ (dose 1 to 2 fluid ounces), Tinctura Senegæ (dose 1 to 2 fluid drachms).

Senega is a most important stimulant expectorant, especially suitable for chronic and subacute cases of bronchitis. It also acts, though to a less extent, on the skin and kidneys. It is best used as Infusion, which may be made the vehicle for Squill, Ammonia, &c. It is said by

some to act on the heart in much the same way as Digitalis.

STYRAX PRÆPARATUS (dose 5 to 20 grains).—*Preparation:* Tinctura Benzoini Composita.

Storax is hardly ever used internally. Its action is similar to that of the Balsams of Peru and Tolu, to which it is closely allied. It is mainly used as Friar's Balsam.

XIII. NARCOTICS AND SEDATIVES.

Under this heading will be included all substances whose special influence seems exerted in allaying pain, and thereby promoting sleep, though the great type of the group—viz., opium—has this effect primarily and independent of any influence on pain. Some of these allay spasm or muscular irritability, but the whole of them seem to act more directly on the nervous system than do any other group of remedies, and hence may be described as *neurotics*.

ACIDUM HYDROCYANICUM DILUTUM (dose 2 to 8 minims).—*Preparation:* Vapor Acidi Hydrocyanici.

Hydrocyanic or *Prussic Acid*, when concentrated, is perhaps the most powerful poison known. Hence in medicine it is used so dilute that only 2 per cent. of the anhydrous acid is contained in the dilute acid of the Pharmacopœia. Another and stronger solution, sometimes called Scheele's Prussic Acid, contains 4 per cent. of the anhydrous acid, and so must be given in corresponding dose. Prussic Acid is used both externally and internally. Externally a lotion may be used containing 2 fluid drachms or so to a pint of water, and in this form is applied to allay irritations of the skin, as in pruritus pudendi. Care must be taken that there is no abrasion, or fatal absorption may follow. Internally, dilute prussic acid is useful in allaying irritability of the stomach, and relieving pain, especially of a neuralgic kind, when affecting that viscus. It is also useful in nervous coughs and in nervous palpitation, but useless in the organic forms of these disorders. The inhalation is useful in the same kinds of disease, and sometimes is of benefit in allaying the cough in phthisis. In all cases it requires to be given with caution, and in a very dilute solution. Mistura

Amygdali is a good vehicle. Glycerine should be added if the acid be used as a lotion.

LAUROCERASI FOLIA (not used internally).—*Preparation:* Aqua Laurocerasi.

The Cherry Laurel owes its efficacy entirely to the Prussic Acid its leaves yield on destillation, but as the proportion of this is very variable, and tends to vary still more by keeping, most prefer to use a definite strength of Prussic Acid, even externally. If used as a lotion, for irritation of the skin and itching, glycerine should be added to it, and care taken to avoid its use if there are any abrasions.

ACONITI FOLIA.—*Preparation:* Extractum Aconiti (dose 1 to 2 grains).

ACONITI RADIX.—*Preparations:* Tinctura Aconiti (dose 5 to 15 minims), Linimentum Aconiti (Aconite Root, Camphor, Spirit).

ACONITIA.—*Preparation:* Unguentum Aconitiæ.

Aconite, whether in the green part or the root, contains the alkaloid *Aconitia*, on which its efficacy depends, but the alkaloid is more abundant in the latter. It produces a kind of tingling when applied to any part, followed by numbness. It affects the heart, lowers the pulse, and so gives rise to weakness and faintness. At the same time it relieves pain. If given in any considerable dose, death speedily follows. Aconitia acts in the same way, but more powerfully. Aconite is used both externally and internally; externally to relieve pain, especially of a neuralgic kind; as in sciatica and sometimes also in chronic or muscular rheumatism; internally it is also used to relieve pain, and by a certain number of practitioners to allay inflammation. Except for this last purpose, when its use should be most carefully watched, it is doubtful whether such a powerful remedy should be prescribed, except under circumstances over which we have full control.

BELLADONNÆ FOLIA.—*Preparations:* Extractum Belladonnæ (dose $\frac{1}{6}$ to 1 grain), Emplastrum Belladonnæ, Tinctura Belladonnæ (dose 5 to 25 minims), Unguentum Belladonnæ.

BELLADONNÆ RADIX.—*Preparation:* Linimentum Belladonnæ. ATROPIA (dose $\frac{1}{60}$ to $\frac{1}{30}$ grain internally). *Preparations:* Liquor Atropiæ (4 grains in 1 ounce, hardly given internally), Unguentum Atropiæ, Atropiæ Sulphas (mainly used for ophthalmic purposes).

Belladonna is a remedy of great potency and of much value. This is due to the presence in every part of the plant of the alkaloid *Atropia.* When applied to the eye, or in its neighbourhood, it causes dilatation of the pupil, and when applied to a painful part, relief commonly follows. Given internally, the pupils will become dilated; the mind is affected if given in large doses, which cause delirium. It acts powerfully on the heart and alimentary canal, increasing their contracting power and relieving pain and spasm. To parts spasmodically contracted Belladonna or Atropine applied locally gives relief, and it is of great use, given either by the stomach, rectum, or under the skin, in spasmodic nervous affections, especially Chorea and Epileptiform attacks. Its full value is hardly yet appreciated. Belladonna plaster is often a local remedy of great value in palpitation.

STRAMONII FOLIA.—Used only for smoking.

STRAMONII SEMINA.—*Preparations:* Extractum Stramonii (dose $\frac{1}{4}$ to $\frac{1}{2}$ grain), Tinctura Stramonii (dose 10 to 25 minims).

Stramonium owes its activity to an alkaloid called *Daturia,* which seems to be in all respects identical with atropia. Hence the action of the two substances is very closely allied. Stramonium is, however, mainly used in spasmodic affections of the respiratory organs, and certainly exerts a powerful influence over certain forms of asthma. One of the best ways of using the drug, in this malady, is to smoke the stramonium leaves in a pipe, or in the form of a cigarette. Otherwise Stramonium is not much used, except in the form of tincture for spasmodic coughs.

HYOSCYAMI FOLIA.—*Preparations:* Extractum Hyoscyami (dose 5 to 10 grains), Tinctura Hyoscyami (dose 30 to 60 minims).

Hyoscyamus in many respects is allied to the two foregoing remedies, and has a similar kind of action. It is, however, weaker, and requires to be given in larger doses.

It is sometimes used as a sedative where we cannot give opium, and to allay pain and spasm in any part. It is often used along with purgatives to prevent them from griping.

CONII FOLIA.—*Preparations:* Cataplasma Conii, Extractum Conii (doses 2 to 5 grains), Pilula Conii Composita (Extract of Hemlock, Ipecacuan, and Treacle; dose 5 to 10 grains), Vapor Conii, Succus Conii (dose 2 drachms to 1 ounce).

CONII SEMINA. — *Preparation:* Tinctura Conii (dose 30 to 80 minims).

Hemlock owes its potency to an alkaloid called *Conia*, of the Ammonia type, and volatile. Hence preparations of the drug obtained by the agency of heat are hardly satisfactory. The best preparation is the Succus, and even this varies considerably in strength. Conium may be said to act on the central nervous system, allaying its excitability, and hence is useful in many cases where, from excess of irritability, either of the nervous centres or of the nerve peripheries, slight stimuli produce inordinate reflex effects. In the same way it allays pain. It is used partly in painful affections, as cancer, again in such affections as give rise to severe spasmodic cough, and in some spasmodic nervous diseases, as Chorea and its allies. For cough the Vapor Conii is the best mode of exhibition; for other forms of mischief, the succus.

TABACI FOLIA.—*Preparation:* Enema Tabaci.

Tobacco owes its efficacy to a volatile alkaloid called *Nicotina* or *Nicotine*. This, as well as the plant itself, is a powerful sedative, acting on the heart and muscular system. Hence its use in any way causes in those unaccustomed to its action profound prostration or fainting. For this it was used in former days, when it was desired to promote complete muscular relaxation, as in reducing a strangulated hernia. Now it is seldom so employed since chloroform has come to take its place, but still to those who are not accustomed to its use a pipe of strong tobacco may have the effect of overcoming obstinate and painful spasm of many parts, as in stricture of the urethra, asthma, &c.

DIGITALIS FOLIA (dose ½ to 2 grains).—*Preparations:* Infusum Digitalis (dose 2 to 4 fluid drachms), Tinctura Digitalis (10 to 30 minims).

DIGITALINUM (dose $\frac{1}{60}$ to $\frac{1}{20}$ grain).

Digitalis owes its activity to the substance *Digitalin*, which is not of the nature of an alkaloid. This is contained in every part of the plant. The action of digitalis is ill understood, but all are agreed upon this: that it produces marked retardation of the heart's beat, and probably also strengthens it. The way in which this is brought about is still open to dispute; but be that as it may, this property of digitalis renders it of great value in the treatment of heart disease, and the evils arising therefrom. If carried to excess it may produce alarming symptoms or even kill, but used aright it is of infinite service. Thus in hypertrophy with dilatation arising from valvular disease it is in the front rank of cardiac medicines. Again it is of the greatest service in certain forms of dropsy arising from heart disease; and in chronic pleurisy with effusion, and sometimes also in ascites combined with squill and blue-pill it is of the utmost service. It has also been introduced into lunacy practice with advantage, being often used in the form of Digitalinum as a subcutaneous injection: in the same way it has proved of value in delirium tremens.

PAPAVERIS CAPSULÆ.—*Preparations:* Decoctum Papaveris, Extractum Papaveris, Syrupus Papaveris.

Poppy Capsules owe all their efficacy to the little opium they contain, and as this varies greatly no preparation of them should be used internally. The hot decoction is, however, very frequently a most soothing local remedy.

OPIUM (dose ½ to 2 grains or more).—*Preparations:* Confectio Opio (Compound Powder of Opium and Syrup; dose 5 to 20 grains), Emplastrum Opii, Enema Opii (Decoction of Starch, 2 ounces, Tincture of Opium, 30 minims), Extractum Opii (dose ½ to 2 grains or more), Extractum Opii Liquidum (dose 4 to 40 minims), Linimentum Opii (Tincture of Opium and Soap Liniment), Pilula Saponis Composita (Opium, Hard Soap; 1 grain of Opium in 5 of pill; also known as Pil. Opii; dose 5 grains or more), Pilula Plumbi cum Opio (Acetate of Lead, Opium, and Confection of Roses; 1 grain of Opium in 8 grains

of pill; dose 4 to 8 grains), Pulvis Cretæ Aromaticus cum Opio (Aromatic Powder of Chalk, Opium; 1 grain of Opium in 40 of Powder; dose 10 to 40 grains), Pulvis Ipecacuanhæ Compositus (Ipecacuanha, Opium, Sulphate of Potash; 1 grain of Opium in 10 of Powder; also known as Dover's Powder; dose 5 to 10 grains), Pulvis Kino Compositus (Kino, Cinnamon, Opium; 1 grain of Opium in 20 of the Powder; dose 5 to 20 grains), Pulvis Opii Compositus (Opium, Black Pepper, Ginger, Caraway, Tragacanth; 1 grain of Opium in 10 of the Powder; dose 2 to 10 grains), Tinctura Opii (1 grain of Opium in 14½ minims; dose 4 to 40 minims), Tinctura Camphoræ Composita (Opium, Benzoic Acid, Camphor, Oil of Anise, Spirit; 1 grain of Opium in ½ ounce of Tincture; also known as Paregoric Elixir; 20 minims to 2 fluid drachms or more), Tinctura Opii Ammoniata (Opium, Saffron, Benzoic Acid, Oil of Anise, strong solution of Ammonia, Rectified Spirit; 1 grain of Opium in 96 minims of Tincture, also known as Scotch Paregoric; dose 15 minims to 1 fluid drachm), Trochisci Opii (Extract of Opium, Tincture of Tolu, Sugar, Gum Acacia, Extract of Liquorice, boiling water; $\frac{1}{10}$ grain of Extract of Opium in each lozenge), Unguentum Gallæ cum Opio (Ointment of Galls and Opium; 1 grain of Opium in 14½ of Ointment), Vinum Opii (Extract of Opium, Cinnamon Bark, Cloves, and Sherry; 22 grains of Extract of Opium in a fluid ounce).

MORPHLÆ HYDROCHLORAS (dose ⅛ to 1 grain).—*Preparations:* Liquor Morphiæ Hydrochloratis (½ grain of Hydrochlorate of Morphia in each fluid drachm; dose 10 to 60 minims), Suppositoria Morphiæ (Hydrochlorate of Morphia, Benzoated Lard, White Wax, Oil of Theobroma; ½ grain of Morphia in each), Trochisci Morphiæ (Hydrochlorate of Morphia, Tincture of Tolu, Sugar, Gum Acacia, Water; $\frac{1}{60}$ grain of Morphia in each), Trochisci Morphiæ et Ipecacuanhæ (the ingredients of Morphia Lozenges together with Ipecacuan powder; $\frac{1}{60}$ grain of Morphia and $\frac{1}{12}$ grain of Ipecacuanha in each.

MORPHLÆ ACETAS (dose ⅛ to 1 grain).—*Preparation:* Liquor Morphiæ Acetatis (½ grain of Morphia in each fluid drachm; dose 10 to 60 minims).

Opium and the most important alkaloid which it con-

tains—viz., *Morphia*, occupy the first rank among remedial agents, chiefly on account of their power in allaying pain, and procuring sleep. In small doses Opium acts as a stimulant, but as ordinarily exhibited it is a pure narcotic; a slight stimulant stage may precede its sedative effect, but this is very transient, and in larger doses is not observed. One peculiar effect of Opium is its power on the pupil, which it causes to contract, sometimes almost to a pin's point. In very large dose the sleep of opium passes into death.

Applied externally Opium relieves pain and spasm, and to this end Tincture of Opium, or Laudanum as it is commonly called, is often added to lotions. It is also largely employed in the form of Suppository by the rectum or vagina, and a solution of the Acetate is now frequently injected below the skin if the full effects of the remedy are desired without interfering with digestion. In this way the dose is usually $\frac{1}{3}$ grain, and it should be given in a solution not exceeding the bulk of 5 minims. It would be hard to enumerate the various uses of Opium, seeing that it is given in the great majority of cases where we have to deal with pain and spasm. It is especially useful in some inflammations where its specific effects—viz., congestion of the lungs and brain, would not prove injurious. Thus in peritonitis its efficacy is great. It is of great value in restraining the tenesmus of dysentery, and the pain in inflammation of the urinary passages. It seems too of great importance in the treatment of diabetes. On most of the secretions save that of the skin Opium exercises an astringent influence, and hence is commonly used for this purpose. It must not, however, be used for too copious secretions from the air-passages, inasmuch as it rather tends to deaden sensibility, which is here essential to the due evacuation of the secreted fluids, and this again is essential to life; but used to diminish excessive irritability, it is often of great service. It must ever be borne in mind that children are very much more susceptible to opium than are adults, so that the greatest care is necessary in prescribing it. Indeed, under the age of one year, it is better avoided altogether. Custom greatly deadens its influence.

LACTUCA.—*Preparation:* Extractum Lactucæ (dose 5 to 30 grains).

Lettuce has a certain reputation as a narcotic, which

is of a somewhat doubtful character. If of any efficacy, that is very small.

LUPULUS.—*Preparations:* Infusum Lupuli (dose 1 to 2 fluid ounces), Tinctura Lupuli (dose 1 to 2 fluid drachms), Extractum Lupuli (dose 5 to 15 grains).

Hops are mainly used for their aromatic and tonic qualities, but they have also a kind of reputation as a narcotic. If used in this way, a pillow of hops is generally employed. The other preparations are probably useless in this way.

CANNABIS INDICA.—*Preparations:* Extractum Cannabis Indicæ (dose ½ to 2 grains), Tinctura Cannabis Indicæ (dose 5 to 20 minims).

Indian Hemp, which is none other than ordinary Hemp ripened under a tropical sun, under such circumstances generates a kind of resin, the properties of which are very peculiar. It produces a kind of delirium or intoxication followed by sleep and insensibility. It is antispasmodic in its characters, and is said to allay spasm and irritability of various organs, especially the respiratory tract. It is also of very great value in dysmenorrhœa and menorrhagia. Its full value is not yet understood. Many of its preparations are valueless.

LOBELIA.—*Preparations:* Tinctura Lobeliæ (dose 10 to 30 minims), Tinctura Lobeliæ Etherea (dose 10 to 30 minims).

Lobelia in many respects acts similarly to tobacco, especially in allaying spasm. It has hence been used in asthma, but if employed in too large doses, it may give rise to sickness, vomiting, and fatal prostration.

VERATRI VIRIDIS RADIX.—*Preparation:* Tinctura Veratri Viridis (dose 5 to 15 minims).

Green Hellebore is largely used in America for its controlling powers over the circulation. In rheumatism it often notably relieves pain, and reduces temperature, but is apt to give rise to vomiting, and other untoward effects. It must always be given with care.

SABADILLA or *Cevadilla* yields VERATRIA.—*Preparation:* Unguentum Veratriæ.

Veratria is sometimes used in similar cases with Aco-

nite. It acts locally as a kind of irritant, and this is followed by a numbing effect. It is, however, a somewhat dangerous remedy.

COLCHICI CORMUS (dose 2 to 8 grains).—*Preparations:* Extractum Colchici (dose ½ to 2 grains), Extractum Colchici Aceticum (dose ½ to 2 grains), Vinum Colchici (dose 10 to 30 minims).

COLCHICI SEMINA.—*Preparation:* Tinctura Colchici Seminum (dose 10 to 30 minims).

Colchicum owes its activity to an alkaloid called *Colchicia*. It acts in a peculiar fashion, directly influencing the heart, giving rise to great prostration, and even sickness and vomiting. Should, however, there be any gouty pain, it is relieved in a marked manner, and that too independently of any increase in the evacuations. It is indeed mainly used for this purpose. Over rheumatism it has no such controlling effect.

CERII OXALAS (dose 1 to 2 grains).

Oxalate of Cerium seems to act as a sedative on the stomach, and hence is sometimes used for vomiting, especially of pregnancy. Its action is allied to that of Silver.

BISMUTHI SUBNITRAS (dose 5 to 30 grains).—*Preparation:* Trochisci Bismuthi; each lozenge contains 2 grains of the salt.

LIQUOR BISMUTHI ET AMMONIÆ CITRATIS (dose ½ to 2 fluid drachms).

BISMUTHI CARBONAS (dose 5 to 20 grains).

Bismuth acts as a decided sedative to the stomach, and hence is of immense value in certain forms of irritable dyspepsia, and in chronic gastric catarrh. But, to do any good, it must be given in good large doses, as at best only a small quantity is dissolved and absorbed. It has also been used as a local application to the skin when irritated and abraded.

POTASSII BROMIDUM and AMMONII BROMIDUM (dose 5 to 30 grains).

The *Bromide of Potassium* has of late years come largely into use in the treatment of epilepsy. In this respect it is of the utmost value, but as a sedative in

other and allied diseases it often fails, as indeed it does in many cases of epilepsy. Sometimes, however, it seems to cure, and in most is of service.

PHYSOSTYGMATIS FABA. — *Preparation:* Extractum Physostygmatis (dose $\frac{1}{16}$ to $\frac{1}{4}$ grain).

Calabar Bean has the power of contracting the pupil to a remarkable extent. It also seems to act on the spinal cord as a sedative, and hence has been used with some success in tetanus.

CHLORAL HYDRAS (not officinal; dose 10 to 30 grains).

Hydrate of Chloral has rapidly attained to a high rank among narcotics, the more especially as it may be given when opium is contra-indicated. It is often of the greatest possible service where there is a restlessness with transient delirium during the night, which opium often increases.

CHLOROFORMUM. — *Preparations:* Linimentum Chloroformi, Spiritus Chloroformi (the old Chloric Ether) (dose 10 to 60 minims), Tinctura Chloroformi Composita (Chloroform, Spirit, Compound Tincture of Cardamoms; dose 20 to 60 minims).

Chloroform, when taken internally, acts as a sedative and antispasmodic, and in this way Spirit of Chloroform is often a valuable adjunct to other remedies when there is great irritability of stomach. It also serves to cover the taste of nauseous medicines. But the main use of Chloroform is as an anæsthetic, as which, however, it is not without danger. It may be used to any extent in this way—to produce only slight unconsciousness, or to go to the verge of arresting both circulation and respiration. We cannot pretend here to discuss the cases in which these various degrees of narcotism are to be employed, but it is a good sound rule to be content with the least which will suffice, and also, as we think, to expend plenty of chloroform, rather than, by limiting the supply of air, to make a small quantity suffice. It is not the quantity expended which is the mark of the danger incurred: it is the degree of concentration in which its vapour reaches the lungs.

XIV. PURGATIVES, OR CATHARTICS.

By purgatives are meant remedies which produce a free action of the bowels, generally with softening of their contents. The simplest members of the group are termed *laxatives*, and include such substances as, being taken in any quantity, tend to make the motions softer, and to be passed more easily. Such are Figs, Prunes, Tamarinds, Cassia, and Manna. The more powerful are termed *drastic* purgatives, and those which give rise to an unusual determination of fluid to the bowel are termed *hydragogues;* those which induce a specially free flow of bile are termed *cholagogues*. To purgatives are frequently added various other substances, as Strychnine and Belladonna, to aid in stimulating the action of the bowels, and aromatic oils and Henbane to prevent griping; whilst other substances, like Ipecacuan, seem to act more as local tonics. All these go by the name of *adjuncts* or *adjuvants*.

ALOE BARBADENSIS (dose 2 to 6 grains).—*Preparations:* Enema Aloes, Extractum Aloes Barbadensis (dose 2 to 6 grains), Pilula Aloes Barbadensis (Barbadoes Aloes, Hard Soap, Oil of Caraway, Confection of Roses; dose 5 to 15 grains), Pilula Aloes et Ferri (Sulphate of Iron, Barbadoes Aloes, Compound Cinnamon Powder, Confection of Roses; dose 5 to 10 grains).

ALOE SOCOTRINA (dose 2 to 6 grains).—*Preparations:* Decoctum Aloes Compositum (Extract of Socotrine Aloes, Myrrh, Saffron, Carbonate of Potash, Extract of Liquorice, Compound Tincture of Cardamoms, Water; dose 1 to 2 fluid ounces), Extractum Aloes Socotrinæ (dose 2 to 6 grains), Pilula Aloes Socotrinæ (Socotrine Aloes, Hard Soap, Volatile Oil of Nutmeg, Confection of Roses; dose 5 to 15 grains), Pilula Aloes et Assafœtidæ (dose 5 to 15 grains), Pilula Aloes et Myrrhæ (Socotrine Aloes, Myrrh, Saffron, Confection of Roses; dose 5 to 15 grains), Tinctura Aloes (dose 1 to 2 fluid drachms), Vinum Aloes (dose 1 to 2 fluid drachms).

Aloes, whether of the Barbadoes or Socotrine variety, constitute one of our most valuable purgatives. They act especially on the great gut, and more particularly on the rectum. They do not greatly augment the intestine

flow, but rather stimulate its muscular action, in rather a gentle fashion. In small doses they act as tonics and stomachics. They are of use in chronic constipation when the patient does not suffer from piles, and they also act on the uterus as emmenagogues, especially when combined with Myrrh and Iron. Decoctum Aloes, Pilula Aloes et Ferri, and Pilula Aloes et Myrrhæ are used in this way. Pilula Aloes et Assafœtidæ is used when the patients show hysterical symptoms. Aloes are seldom given alone. The watery extract is more potent than the simple drug.

CAMBOGIA (dose 1 to 8 grains).—*Preparation:* Pilula Cambogiæ Composita (Gamboge, Barbadoes Aloes, Compound Powder of Cinnamon, Hard Soap, Syrup; dose 5 to 15 grains).

Gamboge is more used as a pigment than as a medicine. Nevertheless, it is a powerful drastic and hydragogue cathartic, and its Compound Pill is sometimes used in the treatment of dropsies. Sometimes, under similar circumstances, it is given along with Cream of Tartar, but in all it requires to be protected by some stimulant oil, or vegetable sedative.

CASSIÆ PULPA (dose 2 to 4 drachms).

Cassia Pulp is hardly ever used by itself in ordinary practice, though distinctly laxative. It is contained in Confectio Sennæ.

COLOCYNTHIDIS PULPA (dose 2 to 6 grains).—*Preparations:* Extractum Colocynthidis Compositum (Colocynth, Extract of Socotrine Aloes, Resin of Scammony, Hard Soap, Cardamoms, Proof Spirit; dose 3 to 10 grains), Pilula Colocynthidis Composita (Colocynth, Barbadoes Aloes, Scammony, Sulphate of Potash, Oil of Cloves; dose 5 to 10 grains), Pilula Colocynthidis et Hyoscyami (Compound Colocynth Pill, Extract of Henbane; dose 5 to 10 grains.

Colocynth is a powerful drastic purgative, griping severely when given by itself, yet very often employed, but mainly in conjunction with other remedies. It may be given in most cases where a purgative is required, except there be also an inflamed condition of the bowel, when it should be avoided. One of the best combinations is the Colocynth and Hyoscyamus Pill, but the Compound

Colocynth Pill, and Extract are admirable excipients for other more or less active remedies.

CROTONIS OLEUM (dose ½ to 2 minims).

Croton Oil is at once a powerful purgative, and a powerful irritant to the skin. As a purgative its prime merit is its small bulk, seeing that a single drop purges violently. It is accordingly used in cases of apoplexy, when it is considered important to give a purgative, either by itself or mixed with sugar. In this way, placed on the back of the tongue, and swallowed by the involuntary muscles, the bowels may be got to act, even under profound insensibility. A very good plan of utilizing it is to add a drop to an ounce or two of castor oil, which is to be taken in two or three doses.

ECBALII FRUCTUS.

ELATERIUM, the sediment from the juice of Ecbalium Officinarum (dose $\frac{1}{12}$ to ½ grain).

Elaterium is an exceedingly powerful drastic purgative, rarely given by itself. It is most frequently prescribed in doses of $\frac{1}{12}$ to $\frac{1}{6}$ grain in Compound Colocynth Extract or Pill, with or without Belladonna, and almost invariably in dropsy, general or ascitic. It is somewhat dangerous.

HYDRARGYRUM. — *Preparations:* Hydrargyrum cum Creta (Grey Powder; dose 3 to 8 grains), Pilula Hydrargyri; Blue Pill; dose 4 to 10 grains).

HYDRARGYRI SUBCHLORIDUM (Calomel; dose 2 to 5 grains).

Mercury, whether taken by itself, in the form of Grey Powder or Blue Pill, or in the form of Calomel, if in sufficiently large dose, acts as a cholagogue purgative. During the period of its action, however, it is apt to produce considerable sickness, but often greatly relieves portal congestion, and mental depression after it has had time to work off. If absorbed, it gives rise to a whole series of changes, but such seldom occur with ordinary purgative doses, provided these act efficiently. Some patients cannot, however, take even the smallest doses of Mercury without its producing a constitutional effect on them.

JALAPA (dose 10 to 30 grains).—*Preparations:* Extractum Jalapæ (dose 5 to 15 grains), Pulvis Jalapæ Compositus (Jalap, Acid Tartrate of Potash, Ginger; dose 10 to 30 grains or more), Tinctura Jalapæ (dose 1 to 2 drachms or more).

JALAPÆ RESINA (dose 2 to 5 grains).

Jalap, whether in powder, or purified as resin, is an efficient cathartic, producing free watery evacuations, but also occasioning much griping. It acts mainly on the higher part of the intestine. Perhaps the Compound Powder of Jalap is the hydragogue cathartic most frequently given to children; it is also used to get rid of worms.

MAGNESIA and MAGNESIA LEVIS (dose 20 to 60 grains).

MAGNESIÆ CARBONAS and MAGNESIÆ CARBONAS LEVIS (dose 20 to 60 grains).—*Preparation:* Liquor Magnesiæ Carbonatis (dose 1 to 2 fluid ounces).

MAGNESIÆ SULPHAS (dose 2 to 6 drachms).—*Preparation:* Enema Magnesiæ Sulphatis.

Magnesia, whether as calcined Magnesia, or as Carbonate, acts at once as an antacid and a laxative. It is thus of peculiar value where the two properties are desired, as where food has been allowed to ferment in the stomach and bowels, and so to give rise to griping, which can only be remedied by removal of the offending substance. A combination of Magnesia and Rhubarb is very often of use in this way. If absorbed, Magnesia renders the urine alkaline. Solution of Carbonate of Magnesia, commonly called Fluid Magnesia, is an excellent habitual laxative taken the first thing in the morning. Sulphate of Magnesia, or Epsom Salts, is a more powerful remedy, but requires to be given in pretty large doses. Of all saline purgatives it is the one most frequently prescribed. It gives rise to copious watery stools, with some amount of griping, especially if given alone. For this reason it is usually combined with some other remedy, as senna, the two constituting the ordinary *black draught*. The addition of Sulphuric Acid to its solution renders it much more palatable.

MANNA (dose 60 grains to ½ oz).

Manna, which is a kind of saccharine secretion from various species of Fraxinus, is hardly ever used by itself as a purgative, save for children. It is, however, often added to Senna, and other nauseous purgatives, to correct their disagreeable taste.

PODOPHYLLI RADIX (dose 10 to 20 grains).

PODOPHILLI RESINA (dose ¼ to 1 grain).

Podophyllum and its resin, sometimes called *Podophyllin*, are active hydragogue purgatives, causing much griping. For this reason they are seldom given alone, and indeed Podophyllum is rarely given at all. The resin is generally combined with Compound Extract of Colocynth, to which Henbane or Belladonna has been added, or more rarely is combined with Cream of Tartar, as in dropsies. Podophyllin is supposed to act specially on the liver, but it does not do more than empty the gall-bladder. Its effects are very uncertain, and become rapidly weakened by prolonged use.

POTASSÆ TARTRAS ACIDA (dose 2 drachms to ½ oz.).

Cream of Tartar is not very often used by itself as a purgative, but is a valuable adjunct to such remedies as Jalap and Sulphur, being found in the Compound Powder of Jalap, and in the Confection of Sulphur. In such combination it is very useful, but is not itself sufficient of a stimulant to the bowels to cause their evacuation, though capable of producing a free flow of fluid into the intestine, especially in dropsies, or of eliminating fluid by the kidneys.

PRUNUM.—Dried plums are only used in domestic practice, or added to an infusion of Senna.

RHEI RADIX (dose 10 to 30 grains).—*Preparations:* Extractum Rhei (dose 5 to 15 grains), Infusum Rhei (dose 1 to 2 fluid ounces), Pilula Rhei Composita (Rhubarb, Socotrine Aloes, Myrrh, Hard Soap, Oil of Peppermint, Treacle; dose 5 to 15 grains), Pulvis Rhei Compositus (Rhubarb, Light Magnesia, Ginger; dose 20 to 60 grains), Syrupus Rhei (Rhubarb, Coriander, Sugar, Spirit, and Water; dose 1 to 4 fluid drachms), Tinctura Rhei (dose as a stomachic, 1 to 2 fluid drachms; as

a purgative ½ to 1 fluid ounce), Vinum Rhei (Rhubarb, Canella Alba, Sherry; dose 1 to 2 fluid drachms).

Rhubarb is of use both as a stomachic and slight tonic, and as a purgative. As a purgative its action is, comparatively speaking, slight, and as it is followed by an astringent effect, it is often given in the beginning of attacks of diarrhœa, especially if due to fermented food, or to any irritant swallowed. For children the Compound Rhubarb Powder, commonly known as Gregory's Powder, is a most valuable remedy, correcting acidity as well as moving the bowels. Sometimes it is well combined with small doses of Grey Powder, or yet again, especially if given to adults, the Bicarbonate of Potash may be added to it. The habitual use of Rhubarb as a purgative is to be deprecated, as it seems gradually to lose its efficacy, and even to be followed by a distinctly astringent effect. It is in many instances a valuable stomachic. For this purpose nothing is better than an Infusion prepared like ordinary tea, or the Wine.

RICINI OLEUM (dose 1 drachm to 1 ounce).

Castor Oil is one of the most popular of purgatives. It does not gripe, acts speedily, and gives rise to a copious, not too liquid motion. Hence its value where there is any irritability of the alimentary organs, and in delicate subjects. Again, given with a few drops of Laudanum, Castor Oil clears out the bowels, and the Laudanum prevents any irritation following. Such a combination is often of the highest value in the ordinary summer diarrhœa. Spirit of Chloroform (Chloric Ether) conceals its taste well, and this to many delicate stomachs is of importance.

SCAMMONIÆ RADIX.—*Preparations:* Scammoniæ Resina (dose 3 to 8 grains), Mistura Scammoniæ (dose ½ to 2 fluid ounces, for a child only).

SCAMMONIUM (dose 5 to 10 grains).—*Preparations:* Confectio Scammonii (Scammony, Ginger, Oil of Caraway, Oil of Cloves, Syrup, and Honey; dose 10 to 30 grains), Pulvis Scammonii Compositus (Scammony, Jalap, Ginger; dose 10 to 20 grains).

Scammony is an active cathartic, purging freely and griping severely. It is mainly used in the form of Compound Powder, or added to other remedies. It is seldom or

never given by itself. Its main use is as a hydragogue in dropsies, and as a vermifuge in children.

SENNA ALEXANDRINA and SENNA INDICA (dose ½ to 2 drachms; seldom given as powder).—*Preparations:* Confectio Sennæ (Senna, Coriander, Tamarinds, Cassia Pulp, Prunes, Extract of Liquorice, Sugar, Water; dose 1 to 2 drachms), Infusum Sennæ (dose 1 to 2 fluid ounces), Mistura Sennæ Composita (Sulphate of Magnesia, Extract of Liquorice, Tincture of Senna, Compound Tincture of Cardamoms, Infusion of Senna; the ordinary black draught; dose 1 to 2 fluid ounces), Tincture of Senna (Senna, Raisins, Caraway, Coriander; dose 1 to 4 fluid drachms), Syrupus Sennæ (Senna, Oil of Coriander, Sugar, Water; dose for infants 1 drachm or more).

Senna is a smart purgative in common use, acting both on the muscular coat of the bowels and so increasing the peristaltic action, and at the same time increasing the watery flow; but to aid the latter it is common to add to it some salt—Epsom, Glauber, or Rochelle. It acts mainly on the small intestines, and is most frequently employed merely to clear out the bowels.

SODÆ SULPHAS, *Glauber's Salts* (dose ½ to 1 ounce).

SODÆ PHOSPHAS, *Tasteless Salts* (dose ½ to 1 ounce).

SODA TARTARATA, *Rochelle Salts* (dose 2 to 6 drachms).

Glauber's Salts is an exceedingly valuable purgative, too much overlooked save in natural purgative waters. Nevertheless, it is very efficient, and if given with a little dilute Sulphuric Acid its taste is greatly improved. *Phosphate of Soda* is a nearly tasteless salt, and is an admirable preparation for children; it can easily be given in soup, as ordinary salt would. *Rochelle Salt* is generally used in Seidlitz Powders, each of which contains about 1½ drachms of this salt. Their purgative power can easily be increased by increasing the dose of salt to 2 or 2½ drachms, and in this way constitute one of the most agreeable of saline purgatives.

SULPHUR SUBLIMATUM and SULPHUR PRECIPITATUM (dose 30 grains to 2 drachms).—*Prepara-*

tion: Confectio Sulphuris (Sublimed Sulphur, Acid Tartrate of Potash, Syrup of Orange Peel).

Sulphur, especially in the form of Confection, is a laxative which acts efficiently yet quietly, only causing a slight looseness, with no purgative effect beyond. It is very useful for persons troubled with piles.

TAMARINDUS.— *Tamarinds* are hardly used by themselves. Sometimes they are given to children.

TEREBINTHINÆ OLEUM (dose ½ to 1 ounce).

Oil of Turpentine is hardly ever used as a purgative, except for tapeworm, and is then generally given in half-ounce doses along with an equal quantity of Castor Oil. It is also frequently used as an enema, a like quantity being given, made into an emulsion with eggs or gruel.

XV. TONICS:

MINERAL AND VEGETABLE.

Tonics are remedies intended to strengthen the digestive function, though some substances which are commonly reckoned among their number have other and important properties. Most of these tonics are vegetable bitters, but among the most important are to be included Iron and its allies. Perhaps, however, Iron, like Cod Liver Oil, ought to be considered a food rather than a medicine. The mineral acids also act as tonics, but in a distinctly chemical way—viz., by aiding digestion.

ACIDUM HYDROCHLORICUM DILUTUM. ACIDUM NITRICUM DILUTUM. ACIDUM NITRO-HYDROCHLORICUM DILUTUM. ACIDUM PHOSPHORICUM DILUTUM (dose 10 to 30 minims).

All the *Mineral Acids* in their dilute form, with the exception perhaps of Sulphuric Acid, are used as tonics; those mainly so used are, however, the Dilute Hydrochloric or Muriatic, and the Dilute Nitro-Hydrochloric Acids. These are preferred, inasmuch as Hydrochloric Acid is the natural acid of digestion. For the same reason it is best given along with or just after food, whilst an alkali should be given before food. The mineral acids are commonly prescribed along with some bitter, sometimes also an aromatic. Their main use as tonics seems to be to supplement the acid of the natural gastric juice, which is often

defective in quantity; and this is the more important inasmuch as pepsine seems to have the power of digesting any quantity of albumen, provided sufficient acid be present.

ANTHEMIDIS FLORES.—*Preparation:* Infusum Anthemidis (dose 1 to 2 fluid ounces).

OLEUM ANTHEMIDIS.—Preparations of Flowers and Oil. Extractum Anthemidis (dose 2 to 10 grains).

Chamomile is a useful if homely tonic and stomachic, long used in domestic practice. Its oil is distinctly stimulant, and hence the properties of the flowers partake of a twofold nature, being partly stimulant, partly tonic. The Infusion is mainly employed, but the Extract is a good basis for pills. If given hot, the Infusion acts as an emetic, and is sometimes given with that end in view.

CALUMBÆ RADIX (dose 10 to 20 grains).—*Preparations:* Extractum Calumbæ (dose 2 to 10 grains), Infusum Calumbæ (dose 1 to 2 fluid ounces), Tinctura Calumbæ (dose 1 to 2 fluid drachms or more).

Calumba is a pure bitter stomachic and tonic, devoid of astringency, owing to the absence of Tannic and Gallic Acids. For this reason it may be prescribed, along with the Salts of Iron, without blackening. It seems to act as a kind of sedative to the stomach as well as a tonic, and hence can be well given in gastric catarrh, and in other irritable states of the organ. Hence, too, it is of use in patients recovering from attacks of acute illness. It is often best given along with small doses of Liquor Potassæ half an hour before food. Subsequently, and in other cases, a mineral acid, as the Nitro-Hydrochloric, may be used instead of an alkali.

CANELLÆ ALBÆ CORTEX (dose 15 to 30 grains).

Canella bark is seldom used by itself, though it is an excellent stomachic and tonic of a stimulant character. It is contained in the Vinum Rhei, and an equal mixture of it and Aloes, called Hiera Picra (vulgarly, Hickory Pickory), is frequently used as a laxative in domestic practice.

CASCARILLÆ CORTEX (dose 10 to 30 grains).—*Preparations:* Infusum Cascarillæ (dose 1 to 2 fluid ounces), Tinctura Cascarillæ (dose 1 to 2 fluid drachms).

Cascarilla, like the former, is a valuable remedy, too much neglected. It is at once a stimulant and a tonic, very useful, therefore, in debility of the stomach, particularly in phthisis. It probably has also some slight expectorant effect, but is seldom if ever given for this alone.

CETRARIA ISLANDICA.—*Preparation:* Decoctum Cetrariæ.

Iceland Moss contains a bitter principle which gives it slight tonic powers, but it is mainly used for the demulcent jelly which its decoction yields on cooling. This jelly is nutritious, and as it contains this bitter principle, acts at the same time as a kind of tonic. It is accordingly used in some cases of phthisis.

CHIRATA.—*Preparations:* Infusum Chiratæ (dose 1 to 2 fluid ounces), Tinctura Chiratæ (dose 1 to 2 fluid drachms).

Chiretta is one of the most valuable simple tonics we possess, especially in combination with a mineral acid and some aromatic. It can be given with great satisfaction in convalescence from fever and other acute diseases. In almost every respect it is closely allied to Gentian—indeed, it owes its activity to the same active principle.

CINCHONÆ FLAVÆ CORTEX. CINCHONÆ PALLIDÆ CORTEX. CINCHONÆ RUBRÆ CORTEX. QUINIÆ SULPHAS (dose of Bark 10 to 60 grains; of Quinine 1 to 20 grains).—*Preparations* of Yellow Bark: Decoctum Cinchonæ Flavæ (dose 1 to 2 fluid ounces), Extractum Cinchonæ Flavæ Liquidum (dose 10 to 60 minims), Infusum Cinchonæ Flavæ (dose 1 to 2 fluid ounces), Tinctura Cinchonæ Flavæ (dose 1 to 2 fluid drachms), Tinctura Cinchonæ Composita (Pale Bark, Bitter Orange Peel, Serpentary, Saffron, Cochineal, Spirit; dose 1 to 2 fluid drachms), Pilula Quiniæ (Quinine and Confection of Hips; dose 2 to 10 grains), Tinctura Quiniæ (Quinine and Tincture of Orange Peel; dose 1 to 2 fluid drachms), Vinum Quiniæ (Quinine, Citric Acid, Orange Wine; dose ½ to 2 fluid ounces).

Cinchona, whether in the form of Bark and its preparations, or in that of Quinine, is a remedy simply invaluable. In small doses Bark and Quinine act as tonics,

aiding digestion and bracing the system generally. For this purpose it is largely used in convalescence from acute disease. It is, however, in the form of Quinine and as an *antiperiodic* that Cinchona is of most value. It is not too much to say that a knowledge of its powers, and a confidence in them, enable us to penetrate and inhabit regions which would be otherwise uninhabitable. It is in the treatment of intermittent and remittent fevers that we see Quinine to the best advantage. In either of these forms of disease it should be given in large full doses during the period of remission, and afterwards continued in smaller quantity, especially if the large dose has averted the subsequent attack. Under such circumstances it is customary to give Quinine in 20-grain doses, especially in the pernicious remittents of tropical climates; but ordinarily such a dose would give rise to throbbing and aching of the head, with considerable discomfort, especially ringing in the ears, and perhaps nausea. For ordinary tonic purposes Quinine is generally given in doses of 1 or 2 grains, but it has recently come into use as a means of reducing high temperature, and then much larger doses require to be given. In the form of neuralgia which tends to intermit and to recur at stated intervals, Quinine in 1—10-grain doses is of the utmost service, but it is of little use in the more ordinary forms of the malady. It is the only remedy which seems to control intermittent hæmaturia.

CUSPARIÆ CORTEX (dose 10 to 40 grains).—*Preparation:* Infusum Cuspariæ (dose 1 to 2 fluid ounces).

Angostura bark is a tonic of some repute, but it is also possessed of considerable anti-periodic powers. Hence it is used in dysentery and low fevers, especially in those regions where it grows. It combines aromatic with tonic properties, and is now mainly used in this country in the form of Aromatic Bitters.

FERRUM.—*Preparations:* Mistura Ferri Aromatica (Pale Cinchona Bark, Calumba, Cloves, Iron Wire, Compound Tincture of Cardamoms, Tincture of Orange Peel, Peppermint, Water; dose 1 to 2 fluid ounces), Vinum Ferri (Iron Wire and Sherry; dose 1 to 2 fluid drachms).

FERRUM REDACTUM (dose 2 to 6 grains).—*Preparation:* Trochisci Ferri Redacti.

FERRI CARBONAS SACCHARATA (dose 5 to 20 grains). — *Preparations:* Mistura Ferri Composita (Powdered Myrrh, Carbonate of Potash, Rose Water, Sulphate of Iron, Spirit of Nutmeg, Sugar; dose 1 to 2 fluid ounces), Pilula Ferri Carbonatis (dose 5 to 20 grains).

FERRI IODIDUM (dose 1 to 5 grains).—*Preparations:* Syrupus Ferri Iodidi (4½ grains of Iodide of Iron to 1 drachm; dose 20 to 60 minims), Pilula Ferri Iodidi (1 grain of Iodide in 2½ of pill; dose 2½ to 5 grains).

FERRI SULPHAS.—FERRI SULPHAS EXSICCATA, FERRI SULPHAS GRANULATA (dose 1 to 5 grains).

FERRI ARSENIAS (dose $\frac{1}{10}$ to $\frac{1}{8}$ grain).

FERRI PHOSPHAS (dose 5 to 10 grains).—*Preparation:* Syrupus Ferri Phosphatis (dose 1 to 2 drachms).

FERRI OXIDUM MAGNETICUM (dose 3 to 5 grains.)

FERRI PEROXIDUM HYDRATUM (dose 10 to 60 grains), FERRI PEROXIDUM HUMIDUM (only as an antidote).

FERRI PERCHLORIDI LIQUOR FORTIOR (dose 3 to 10 minims).—*Preparations:* Liquor Ferri Perchloridi (dose 10 to 60 minims), Tinctura Ferri Perchloridi (dose 10 to 60 minims).

FERRI PERNITRATIS LIQUOR (dose 10 to 40 minims).

FERRI ET AMMONIÆ CITRAS (dose 5 to 10 grains).—*Preparation:* Vinum Ferri Citratis (dose 1 to 4 fluid drachms).

FERRUM TARTARATUM (dose 5 to 20 grains).

FERRI ET QUINLÆ CITRAS (dose 5 to 20 grains). *Iron*, though commonly reckoned among Tonics, ought rather, seeing that it supplies an essential element in the constitution of the body, to be considered a special kind of food. Its preparations admit of being arranged into two well-marked groups—the astringent and the non-astringent. Of the former, the Sulphate, the Perchloride, and the Pernitrate are the most important: all other preparations may, in a certain way, be considered non-astringent, or at all events only slightly so. As Astringents the Iron Salts have this disadvantage—that they cannot be combined with Tannic or Gallic Acids, with which they form inky compounds. The solutions of the Perchloride and Pernitrate are powerful local and general astringents and hæmostatics. As Tonics the Salts of Iron, or Iron itself, are often of very great service, inasmuch as the iron they thus supply is a requisite constituent of the colouring matter of blood and muscle, and a necessity for the due carrying of oxygen to remote parts of the organism. Wherever the colouring matter of the blood is deficient, as in anæmia, general debility, and in many more distinctly localized diseases, as some of the nervous system, Iron does good. All Salts of Iron have a tendency to produce constipation, and this should either be avoided by giving them along with purgatives, or a purgative should be administered from time to time. Such a combination of Aloes and Iron, of Iron and Nux Vomica, and so on, is often of great service; the former constituting one of the most valuable remedies for deficient menstruation when due to or associated with anæmia. For this purpose the non-astringent preparations are best, especially the Saccharated Carbonate. The Iodide of Iron unites the qualities of Iodine and Iron; its chief value is in scrofula, particularly in children, and in constitutional syphilis. The phosphate is also of use in debilitated children, and in rickets.

GENTIANÆ RADIX (dose 10 to 30 grains).—*Preparations:* Extractum Gentianæ (dose 3 to 5 grains), Infusum Gentianæ Compositum (Gentian, Bitter Orange Peel, fresh Lemon Peel, Water; dose 1 to 2 fluid ounces), Mistura Gentianæ (Gentian, Bitter Orange Peel, Coriander, Spirit, and Water; dose 1 to 2 fluid ounces), Tinctura Gentianæ Composita (Gentian, Bitter Orange Peel, Cardamoms, Spirit; dose 1 to 2 fluid drachms).

Gentian is a pure bitter tonic, largely used by itself and in combination with others, as a remedy in ordinary indigestion. It is also of great value in convalescence from acute disease.

NECTANDRÆ CORTEX.—*Preparation:* Beberiæ Sulphas (dose 1 to 10 grains).

Bebeeru and its alkaloid are sometimes used in place of Bark and Quinine, but are not nearly so efficacious. They do, however, possess some tonic and antiperiodic properties.

QUASSIÆ LIGNUM.—*Preparations:* Extractum Quassiæ (dose 2 to 5 grains), Infusum Quassiæ (dose 1 to 2 fluid ounces), Tinctura Quassiæ (dose 1 to 2 fluid drachms).

Quassia is a purely bitter tonic, devoid of astringency, and hence well suited as a vehicle for the Salts of Iron. It is used in many various maladies, where such properties are in request.

TARAXACI RADIX.—*Preparations:* Decoctum Taraxaci (dose 1 to 2 fluid ounces), Extractum Taraxaci (dose 5 to 30 grains), Succus Taraxaci (dose 1 to 2 fluid drachms).

Taraxacum or *Dandelion* is a remedy of uncertain value. Some esteem it highly, others think it is only of value for the drugs given along with it. It is commonly given in cases of indigestion associated with derangement of the liver, but is usually associated with more active remedies.

XVI.—STIMULANTS:

COMMON AND SPECIAL, INCLUDING ALTERATIVES.

By stimulants are meant remedies which exercise a well marked influence on the system generally, or on some part or organ in particular. This mainly consists in increasing its vascularity, in elevating its temperature, in promoting its functions. The group as above

defined is an exceedingly extensive, and infinitely various one.

ACIDUM CARBOLICUM. — *Preparation:* Glycerinum Acidi Carbolici.

Carbolic Acid acts as a powerful stimulant to the skin and mucous membranes, if applied directly to these, but it is mainly used for its antiseptic properties, which are very great. In this way it probably acts by destroying those lowly organisms which are associated with putrefactive change; it averts fœtor and deodorizes discharges. Sometimes, but more rarely, it is given internally to arrest putrefactive changes in the stomach and bowels. For this purpose the preparations called Sulpho-Carbolates are more useful than Carbolic Acid.

ÆTHER (dose 20 minims to 1 fluid drachm).—*Preparation:* Spiritus Ætheris (dose 30 minims to 2 fluid drachms).

Ether, or Sulphuric Ether, is a powerful diffusible stimulant, rapidly creating a feeling of warmth throughout the body, but rapidly ceasing to act. It is of great use internally in painful spasm of many parts, in angina, in palpitation, in spasmodic dyspnœa, cramps, &c. In many of these it acts better when inhaled than when given by the mouth. Given by inhalation it creates anæsthesia, but less rapidly than Chloroform. It is, however, considered safer, especially for long and tedious operations. Applied as spray it may be used to produce local anæsthesia.

ALCOHOL.

Alcohol is hardly used by itself in medicine; but in the form of wine and brandy it is extensively used for stimulant purposes, particularly in diseases associated with great depression. Its exact mode of action is as yet unsettled, but it may be said to act in many respects as a powerful and rapidly diffusible stimulant, its use being accompanied by a feeling of warmth, and probably favouring the flow of the gastric juice. Brandy or other spirit is often used in fever, and in other depressed conditions of the system, and spirit itself is sometimes used as a local stimulant when bed-sores threaten to form. The "how, when, and where" to give Alcohol is too wide a subject to be here discussed.

AMMONIÆ LIQUOR FORTIOR.—*Preparations:* Liquor Ammoniæ (dose 10 to 20 minims), Linimentum Ammoniæ, Spiritus Ammoniæ Fortidus (strong Solution of Ammonia, Assafœtida, Spirit; dose 1 to 2 fluid drachms).

AMMONIÆ CARBONAS (dose 3 to 10 grains).—*Preparation:* Spiritus Ammoniæ Aromaticus (Carbonate of Ammonia, strong Solution of Ammonia, Volatile Oil of Nutmeg, Oil of Lemon, Spirit, and Water; dose 30 to 60 minims or more).

Ammonia and its *carbonate*, besides being antacid, are powerful diffusible stimuli, increasing the rapidity of the circulation, favouring secretion, especially the bronchial, and allaying some forms of spasm. Its effects, however, pass away in no long time. It is used in the typhoid stage of fever, in hysteria, in delirium, and in the bronchitis of the aged. It is also used externally as a rubefacient, or as a stimulant liniment, especially in the well-known form of Hartshorn and Oil. It has many other applications.

AMMONII CHLORIDUM (dose 5 to 30 grains).

Sal Ammoniac is employed abroad in a variety of cases where we employ Mercury and Iodine. Given internally it is useful in some forms of neuralgia, and has some influence over chronic bronchitis. It is also used by some in hepatic congestion, and in amenorrhœa dependent on congestion of the uterus.

ARGENTI NITRAS (dose $\frac{1}{8}$ to $\frac{1}{3}$ grain).

Nitrate of Silver is used as a stimulant externally and internally. Sometimes it is applied to poisoned wounds to arrest absorption, to erysipelatous surfaces to arrest the spread of the disease, or, again, as a wash or lotion to the eyes and elsewhere. Internally it is mainly used in irritable conditions of the stomach, especially where due to chronic catarrh, and it is largely used in the treatment of some nervous complaints, as neuralgia and chorea. If given too long, there is a risk of its being deposited in the skin and darkening the surface.

ARGENTI OXIDUM (dose $\frac{1}{2}$ to 2 grains).

The *Oxide of Silver* differs from the Nitrate in being less stimulant, and therefore better adapted for internal

use when only its remote effects are desired, especially in epilepsy. It is also useful in dyspepsia.

ARMORACLÆ RADIX. — *Preparation:* Spiritus Armoraciæ Compositus (Horseradish, Orange Peel, Nutmeg, Spirit; dose 1 to 2 fluid drachms).

Horseradish is mainly used as a condiment, but the Compound Spirit is an admirable addition to tonic remedies of a simple kind when some stimulant is also desired.

ARNICÆ RADIX.—*Preparation:* Tinctura Arnicæ (dose 30 minims to 1 drachm).

Arnica is a distinct stimulant, and has been given as such in chronic rheumatism, but is rarely used internally. Most frequently it is applied externally in the form of Tincture, for bruises and sprains, but has little real efficacy.

ARSENICUM. ACIDUM ARSENIOSUM (dose $\frac{1}{50}$ to $\frac{1}{12}$ grain).—*Preparation:* Liquor Arsenicalis, Fowler's Solution (dose 2 to 5 minims).

LIQUOR ARSENICI HYDROCHLORICUM (dose 2 to 8 minims).

SODÆ ARSENIAS (dose $\frac{1}{12}$ to $\frac{1}{2}$ grain).

Arsenic in small doses exercises a well marked stimulant effect on the stomach, the glandular system generally, the nervous system, and the skin. It is a valuable nervine tonic, of great service in neuralgia, epilepsy, and chorea. It is the main remedy in skin affections, especially of the scaly kind, and it is useful in advanced syphilis. Moreover, it is the most valuable antiperiodic we know after Quinine, and sometimes succeeds where Quinine fails. With all this, being a dangerous poison, it must be given with great care, and is best administered after meals.

AURANTII CORTEX. — *Preparations:* Infusum Aurantii (dose 1 to 2 fluid ounces), Infusum Aurantii Compositum (Bitter Orange Peel, fresh Lemon Peel, Cloves, Water; dose 1 to 2 fluid ounces), Syrupus Aurantii (dose 1 to 2 fluid drachms), Tinctura Aurantii (dose 1 to 2 fluid drachms).

AURANTII FLORIS AQUA.—*Preparation:* Syrupus Aurantii Floris Aquæ (dose 1 to 2 fluid drachms).

Orange Peel and *Orange Flower Water* are mainly used as agreeable vehicles of disagreeable remedies, or, otherwise, to cover their taste. The peel possesses some tonic properties.

CAMPHORA (dose 1 to 10 grains).—*Preparations:* Aqua Camphoræ or Mistura Camphoræ (dose 1 to 2 fluid ounces), Linimentum Camphoræ, Linimentum Camphoræ Compositum (Camphor, Oil of Lavender, strong Solution of Ammonia, Spirit), Spiritus Camphoræ, Tinctura Camphoræ Composita (Opium, Benzoic Acid, Oil of Anise, Camphor, Spirit; dose 15 minims to 2 fluid drachms).

Camphor is a stimulant, whether applied externally or given internally. Externally it is used as a liniment to sprains and old bruises. Internally it is sometimes given in nervous affections, and in some fevers. It is also used as a kind of sedative in affections of the urinary organs. The Compound Tincture is used as a preparation of Opium only.

CAPSICI FRUCTUS (dose ½ to 1 grain).—*Preparation:* Tinctura Capsici (dose 10 to 20 minims).

Capsicum is mainly used as a condiment, sometimes also as a special stimulant and gargle. The Tincture is sometimes used in delirium tremens.

CEREVISIÆ FERMENTUM.—*Preparation:* Cataplasma Cerevisiæ.

Yeast is only used as a poultice to foul sloughing sores and Carbuncles. Some have given it internally in diabetes, but with slight effect.

CHLORUM. LIQUOR CHLORI. — *Preparation:* Vapor Chlori.

Chlorine in this form, and in that of CALX CHLORATA, and LIQUOR SODÆ CHLORATÆ, is a powerful disinfectant. Hence, these in various forms have been used as gargles in malignant sore throat, in scarlet fever, diphtheria, ptyalism, &c., and with good effect. The inhalation, where not too irritant, does good in cases of fœtid sputum, whether arising from phthisis or chronic bronchitis with bronchial dilatation.

COPAIBA (dose 15 minims to 1 drachm). Oleum Copaibæ (dose 5 to 20 minims).

Copaiva is a stimulant to mucous membranes, and is mainly used in the treatment of gonorrhœa in the male. Nowadays, however, it is to a considerable extent superseded by injections. It is often of great service in the chronic bronchitis of the aged.

CREASOTUM (dose 1 to 3 minims).—*Preparations:* Mistura Creasoti (Creasote, Glacial Acetic Acid, Spirit of Juniper, Syrup, and Water; dose ½ to 1 fluid ounce), Unguentum Creasoti, Vapor Creasoti.

Creasote, which differs little from Carbolic Acid, is used both externally and internally. It is used to stop toothache, to arrest certain forms of skin disease, especially those depending on vegetable parasites, and in various other ways. It is also given with great advantage in fermentative dyspepsia and vomiting, sometimes also in diabetes. The inhalation is of great service in checking profuse and fœtid expectoration, and also does good in phthisis.

CUBEBA (dose 30 grains to 2 drachms).—*Preparation:* Tinctura Cubebæ (dose 30 to 60 minims).

OLEUM CUBEBÆ (dose 5 to 20 minims).

Cubebs and their oil may be said to be only used in the treatment of gonorrhœa, or of similar affections of the genito-urinary tract, in the male. To these and other mucous membranes Cubeb Pepper acts as a powerful stimulant, and hence its value.

PIPER NIGRUM.—*Preparation:* Confectio Piperis (Black Pepper, Caraway, Honey—*Ward's Paste;* dose 1 to 2 drachms).

Ordinary *Black Pepper* is closely allied in many respects to the preceding, but is used almost entirely in the form of Confection for the treatment of piles.

HYDRARGYRUM.—*Preparations:* Hydrargyrum c. Creta (dose 3 to 8 grains), Pilula Hydrargyri (dose 3 to 8 grains), Emplastrum Hydrargyri, Emplastrum Ammoniaci c. Hydrargyro, Unguentum Hydrargyri, Unguentum

Hydrargyri Compositum, Linimentum Hydrargyri, Suppositoria Hydrargyri.

HYDRARGYRI SUBCHLORIDUM (dose $\frac{1}{2}$ to 3 grains).—*Preparations:* Lotio Hydrargyri Nigra, Pilula Hydrargyri Subchloridi Composita (Calomel, Sulphuretted Antimony, Guaiacum Resin, Castor Oil; dose 5 to 10 grains), Unguentum Hydrargyri Subchloridi.

HYDRARGYRI PERCHLORIDUM (dose $\frac{1}{10}$ to $\frac{1}{4}$ grain).—*Preparations:* Liquor Hydrargyri Perchloridi (dose $\frac{1}{2}$ to 2 fluid drachms), Lotio Hydrargyri Flava.

HYDRARGYRUM AMMONIATUM.—*Preparation:* Unguentum Hydrargyri Ammoniati.

HYDRARGYRI IODIDUM VIRIDE (dose 1 to 3 grains).

HYDRARGYRI IODIDUM RUBRUM (dose $\frac{1}{12}$ to $\frac{1}{4}$ grain).—*Preparation:* Unguentum Hydrargyri Iodidi Rubri.

HYDRARGYRI OXIDUM RUBRUM.—*Preparation:* Unguentum Hydrargyri Oxidi Rubri.

HYDRARGYRI NITRATIS LIQUOR ACIDUS.—*Preparation:* Unguentum Hydrargyri Nitratis.

Mercury, if introduced into the system, gives rise to certain important changes, chief among which are increased activity of the secreting organs. The glands especially affected are the salivary glands. After Mercury has been given for some time, the flow of saliva is so much increased as to give rise to the term salivation in describing this effect of Mercury. At the same time, if the salivation be very severe, there may be produced some degree of inflammation of neighbouring organs, and even sloughing of the cheek. The liver is also acted upon, and the flow of bile increased. This augmented flow favours the action of the bowels, and so Mercury acts as a purgative. Probably, however, other secretions share in this as well as that of the liver. Mercury, too, often acts on the kidneys, and causes an

increased flow of urine. Moreover, if fluids are effused into any of the cavities of the body, the absorption of these is promoted, and if other inflammatory products exist, they, too, are often more rapidly absorbed under the use of a mercurial. In the olden time Mercury was invariably used in the treatment of certain forms of inflammation; perhaps nowadays it is too much neglected. It is, however, in the treatment of syphilis that Mercury is of most use. It may be said to be a kind of antidote to that poison when it has begun to affect the system. Here it is best given by inunction. Grey Powder (Hydrargyrum c. Creta) is a favourite remedy in children's diseases, but is often a dangerous one. Blue Pill is used both as a purgative, and as a means of mercurialization. Calomel was formerly used in inflammatory affections, now mainly as a purgative. Corrosive Sublimate is a powerful local irritant, but given in small doses is useful as an alterative. The Iodides of Mercury are used where it is desired to combine the uses of Iodine and Mercury. The Acid Nitrate of Mercury is a powerful local irritant and caustic.

IODUM.—*Preparations:* Linimentum Iodi, Liquor Iodi, Tinctura Iodi (dose 5 to 20 minims), Unguentum Iodi, Vapor Iodi.

POTASSII IODIDUM (dose 2 to 30 grains).—*Preparations:* Unguentum Potassii Iodidi, Linimentum Potassii Iodidi cum Sapone.

SULPHURIS IODIDUM (dose ½ to 2 grains).—*Preparation:* Unguentum Sulphuris Iodidi.

Iodine, when applied to the skin, acts as a powerful counter-irritant, and may even be used to blister, but is very painful. Taken internally or absorbed, it acts throughout the system, especially on the glandular organs, and on new formations. The secretions of glandular organs it promotes, and if there be any chronic enlargement of them, tends greatly to favour its removal. This is especially seen in goitre, scrofulous glands, and again in the stage of syphilis characterized by gummy tumours. Iodine is mainly prescribed internally in the form of Iodide of Potassium, which does not give rise to the irritant effects of Iodine itself. Externally Iodine is

often painted over tumours, and other kinds of swelling, to promote their removal, and in this way is often of great service. It is, however, in the third or tertiary stage of syphilis that Iodide of Potassium is of most service, and here it may be said to be of as much value as Mercury is in the earlier ones. The inhalation may be useful in phthisis, but is an irritant, and may therefore induce cough. The Iodide of Sulphur is mainly used in skin diseases.

MYRRHA (dose 10 to 30 grains).—*Preparations:* Pilula Aloes et Myrrhæ (Socotrine Aloes, Myrrh, Saffron, Confection of Roses; dose 5 to 15 grains), Tinctura Myrrhæ (dose 1 to 2 fluid drachms).

Myrrh is a stimulant, widely used, and in very various diseases. It is seldom given by itself, but generally with other substances; sometimes as an expectorant, sometimes as an emmenagogue, and again as a tonic. As a local stimulant the Tincture is a good deal used, mixed with water, as an application to spongy gums.

MASTICH, ELEMI (*Preparation:* Unguentum Elemi), RESINA (*Preparations:* Emplastrum Resinæ, Unguentum Resinæ), THUS AMERICANUM, PIX BURGUNDICA (*Preparation:* Emplastrum Picis), are all used much in the same way as topical stimulants of no great power, Resin being their type.

GUAIACI LIGNUM.

GUAIACI RESINA (dose 10 to 30 grains).—*Preparations:* Mistura Guaiaci (Powdered Guaiacum, Sugar, Gum Arabic, Cinnamon, Water; dose 1 to 2 fluid ounces), Tinctura Guaiaci Ammoniata (Guaiacum, Aromatic Spirit of Ammonia; dose 1 to 2 fluid drachms).

Guaiacum resin is a stimulant of a peculiar kind. It is mainly used in chronic rheumatism, and in syphilitic pains, sometimes also in skin diseases, but is seldom given by itself. In much the same category are SASSAFRAS and MEZEREON, which are perhaps more distinctly diaphoretic.

SARSÆ RADIX—*Preparations:* Decoctum Sarsæ (dose 1 to 10 fluid ounces), Decoctum Sarsæ Compositum

(Jamaica Sarsaparilla, Sassafras, Liquorice, Mezereon, Water; dose 1 to 10 fluid ounces), Extractum Sarsæ Liquidum (dose 1 to 4 fluid drachms).

Sarsaparilla has no longer the reputation which once belonged to it in secondary syphilis. It is, however, of undoubted benefit in that malady, if the Decoction be given in doses of half a pint, or so, three or four times a day. It is also of some value in chronic rheumatism, especially in the form of the Compound Decoction, which acts as a kind of stimulant diaphoretic.

AMMONIACUM (dose 10 to 30 grains).—*Preparations:* Emplastrum Ammoniaci c. Hydrargyro (Ammoniacum, Mercury, Olive Oil, and Sulphur), Mistura Ammoniaci (dose ½ to 2 fluid ounces).

Ammoniacum is a stimulant gum resin, mainly used as an expectorant in the chronic bronchitis of the aged. Locally it also acts as a stimulant, and hence the plaster is sometimes applied to indolent tumours.

GALBANUM (dose 10 to 30 grains).—Emplastrum Galbani.

Galbanum acts at once as a stimulant, an expectorant, and to a certain extent also as an antispasmodic. It is sometimes given in amenorrhœa.

ASSAFŒTIDA (dose 5 to 30 grains).—*Preparations:* Enema Assafœtidæ, Pilula Aloes et Assafœtidæ (Socotrine Aloes, Hard Soap, Assafœtida, Confection of Roses; dose 5 to 15 grains), Pilula Assafœtidæ Composita (Assafœtida, Galbanum, Myrrh, Treacle; dose 5 to 15 grains), Spiritus Ammoniæ Fœtidus (Assafœtida, strong Solution of Ammonia, Spirit; dose ½ to 1 fluid drachm), Tinctura Assafœtidæ (dose ½ to 1 fluid drachm).

Assafœtida is a fœtid gum resin, possessing distinct stimulant, and antispasmodic properties. It is especially useful in hysteria, and in hysterical flatulence. It may also be given in chronic bronchitis, but it is mainly used in hysteria, especially with deranged digestive and menstrual functions.

SUMBUL RADIX.—*Preparation:* Tinctura Sumbul (dose 10 to 30 minims).

Sumbul, or Musk Root, is a stimulant very similar in

its characters to Valerian. It has, however, been used in low fevers, but seldom in this country.

VALERIANÆ RADIX (dose 15 to 30 grains).—*Preparations:* Infusum Valerianæ (dose 1 to 2 fluid ounces), Tinctura Valerianæ (dose 1 to 2 fluid drachms), Tinctura Valerianæ Ammoniata (Valerian, Aromatic Spirit of Ammonia; dose 1 to 2 fluid drachms).

Valerian is a powerful stimulant and antispasmodic, extensively used in nervous diseases, especially hysterical affections, chorea, epilepsy, and the like. Valerian is often combined with Zinc, and a VALERIANATE OF ZINC is officinal (dose 1 to 4 grains). This some prefer to the Galenical preparations of Valerian.

NUX VOMICA (dose 2 to 5 grains).—*Preparations:* Extractum Nucis Vomicæ (dose $\frac{1}{2}$ to 2 grains). Tinctura Nucis Vomicæ (dose 10 to 20 minims).

STRYCHNIA (dose $\frac{1}{30}$ to $\frac{1}{6}$ grain).—*Preparation:* Liquor Strychniæ (dose 5 to 15 minims).

Nux Vomica and its alkaloid, *Strychnia*, are remedies of great value, but are also dangerous poisons. Given in small doses they are valuable as tonics, and as aids to moving the bowels. They are also of use in paralysis, but mainly, probably, as tonics. In many nervous affections, especially hypochondriasis and hysteria, they are of marked service. They may also be used after acute illness and in other forms of debility.

SERPENTARIÆ RADIX.—*Preparations:* Infusum Serpentaria (dose 1 to 2 fluid ounces), Tinctura Serpentariæ (dose 1 to 2 fluid drachms).

Serpentary is a kind of stimulant, sometimes used with advantage when a tonic is desired to be combined with a kind of alterative and stimulant action, as in old standing cases of gout and rheumatism. Its action in some degree resembles that of Mezereon and Guaiacum.

TEREBINTHINÆ OLEUM (dose 10 to 30 minims).—*Preparations:* Confectio Terebinthinæ (dose 1 to 2 drachms), Enema Terebinthinæ, Linimentum Terebinthinæ, Linimentum Terebinthinæ Aceticum, Unguentum Terebinthinæ.

Oil of Turpentine is used as a stimulant, both externally

and internally. Applied with hot cloths to any part it relieves pain and spasm, and is especially useful in tympanites. It acts on the mucous membranes, and the kidneys, and is also useful in hysterical affections.

PIX LIQUIDA (dose 20 to 40 minims).—*Preparation:* Unguentum Picis Liquidæ.

Tar is an exceedingly valuable remedy in many forms of skin diseases, especially of the chronic scaly kind. It is also used in some cases of bronchitis, and its vapour is useful in preventing excessive and fœtid expectoration.

In the group of stimulants are a crowd of substances mainly used as flavouring agents, and possessing some stimulant properties depending on an essential volatile oil. They are hardly worth separate description in a sketch like this, and may be classed together.

ANETHI FRUCTUS and OLEUM (DILL).—*Preparation:* Aqua Anethi. ANISI OLEUM.—*Preparation:* Essentia Anisi. FŒNICULI FRUCTUS.—*Preparation:* Aqua Fœniculi. CORIANDRI FRUCTUS and OLEUM. CARUI FRUCTUS and OLEUM. CARDAMOMUM.—*Preparation:* Tinctura Cardamomi Composita. ZINGIBER.—*Preparations:* Syrupus Zingiberis, Tinctura Zingiberis, Tinctura Zingiberis Fortior. CARYOPHYLLUM and CARYOPHYLLI OLEUM.—*Preparation:* Infusum Caryophylli. PIMENTA and PIMENTÆ OLEUM.—*Preparation:* Aqua Pimentæ. OLEUM CAJUPUTI.—*Preparation:* Spiritus Cajuputi. CINNAMOMI CORTEX and CINNAMOMI OLEUM.—*Preparations:* Aqua Cinnamomi, Pulvis Cinnamomi Compositus, Tinctura Cinnamomi. MYRISTICA, MYRISTICÆ OLEUM EXPRESSUM. MYRISTICÆ OLEUM.—*Preparation:* Spiritus Myristicæ. ROSMARINI OLEUM.—*Preparation:* Spiritus Rosmarini. LAVANDULÆ OLEUM.—*Preparations:* Spiritus Lavandulæ, and Tinctura Lavandulæ Composita. MENTHÆ PIPERITÆ OLEUM.—*Preparations:* Aqua Menthæ Piperitæ, Essentia Mentha Piperitæ, and Spiritus Menthæ Piperitæ. MENTHÆ OLEUM.—*Preparation:* Aqua Menthæ Viridis, &c. &c.

These are almost all given in the same dose, the Oils in that of a drop or two; the Spirits from ½ to 1 fluid drachm; the Waters from 1 to 2 fluid ounces. The Waters are very often used as vehicles of stronger remedies.

MISCELLANEOUS.

It would be impossible to classify every drug or remedial agent under one or other of the above groups, and certain of the less important have been purposely omitted. There are, however, a few substances which still deserve attention.

CARBO LIGNI.—*Preparation:* Cataplasma Carbonis Ligni.

CARBO ANIMALIS, and CARBO ANIMALIS PURIFICATUM (dose a teaspoonful or more).

Charcoal is used externally mainly as a poultice to foul ulcers, and it has remarkable powers of absorbing evil odours. It is used internally in cases of flatulence and acidity, and also as an antidote to some of the vegetable poisons.

PHOSPHORUS (dose $\frac{1}{40}$ to $\frac{1}{10}$ grain).

Phosphorus is not very often given internally in this country, but it has been introduced as a remedy of some power in nervous diseases. In large doses it is a violent poison. It is not very easily given, except dissolved in oil or resin, which is not a pleasant preparation.

HIRUDO.

Leeches are comparatively little used now, but sometimes it is judged advisable to withdraw blood if there is local inflammation at a spot easily reached. Each leech, by the aid of careful subsequent fomentation, may be made to take away about half an ounce of blood.

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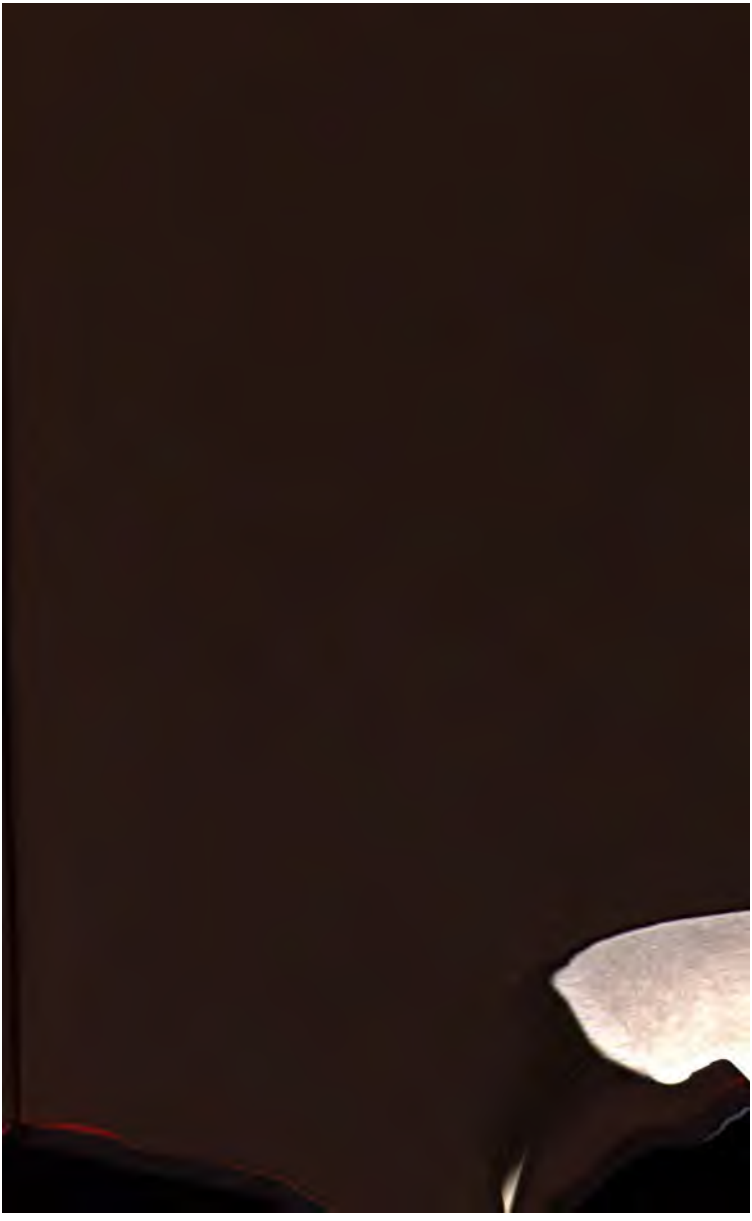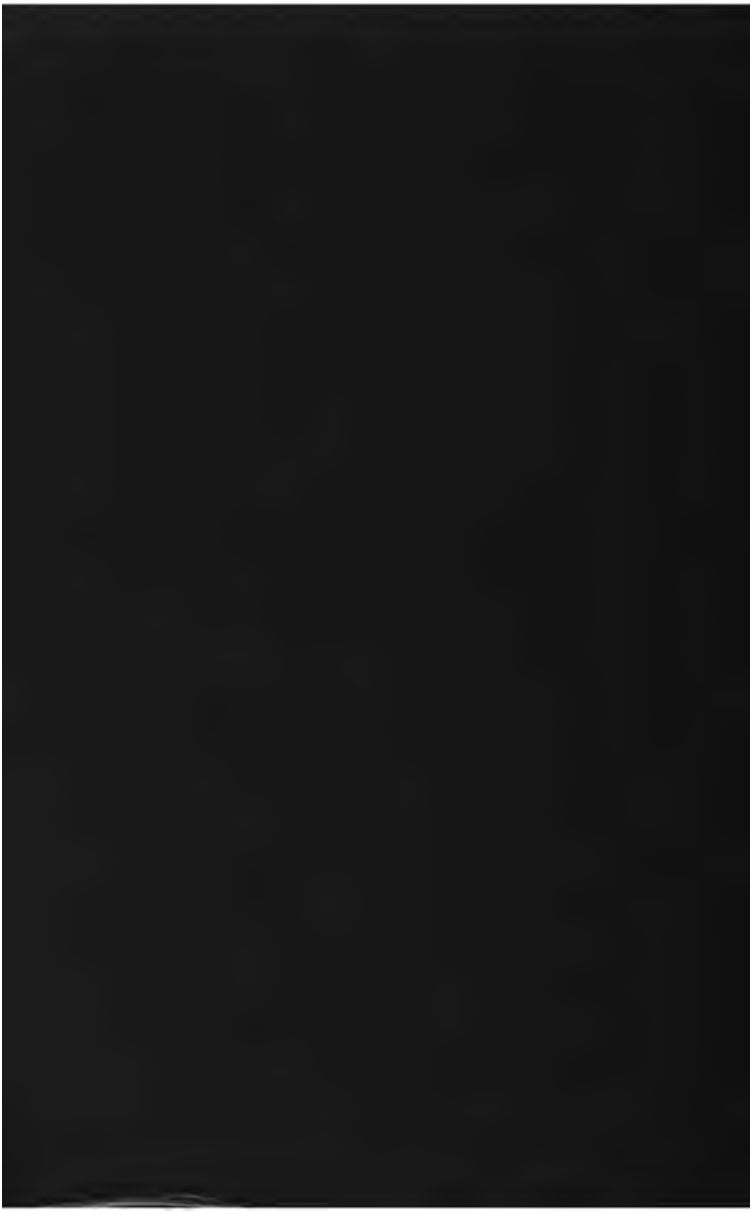
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